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ABSTRACT

A protocol materials program was developed to (1) train personnel who produce, use, and make budgetary decisions about protocol materials and (2) produce and disseminate effective materials and knowledge acquired as a result of the program. Two groups were selected to meet the goals of the program--one group consisting of project directors who developed the materials, the other group consisting of those who provided technical assistance and consultant services. The protocol program was confronted with three major conceptual issues: (1) What is a protocol? (2) What bases ought to be established to identify concepts for the program? (3) How should concepts be portrayed? These led to the affirmation that the purpose of protocol materials is to serve the conceptual foundations of the study of teaching and to enhance the teacher's understanding of the complex basis of his work. Since technology is central to protocol development, one task of the program was to develop a description of standards for protocol materials. Evaluation of protocol materials--the assessment of their influence on teacher behavior and pupil learning--was found to have five phases: anticipation of future criteria; assessment of audience response; collection of learning data; observation of comparative efficiency; and appraisal of purchase and use. The problems of protocol development, including the lack of technical knowledge of some developers and vocabulary standardization, were also broached. It was found that protocols represent one way in which the results of research can be applied to the task of preparing teachers. If properly used, they will develop the teacher's ability to observe behavior objectively, to become more sensitized to aspects of behavior, to understand concepts in terms of actual behavior, and to recognize the importance of systematic diagnoses of behavior. (MM)

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DEVELOPMENT OF PROTOCOL MATERIALS IN TEACHER EDUCATION

A Case Study in Relating Theory and Practice

SP010 219

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Chapter I

Materials for Professional Preparation

By Donald E. Orlosky

Materials for instruction are an integral part of the resources utilized in the schools for teaching pupils. Materials for teaching educational personnel are not so common. Educational personnel most frequently obtain their training through three activities. One of these activities is reading about teaching, another is discussing teaching and its components, and the third includes practicum or actual teaching. There are come exceptions to this limited list of activities such as micro-teaching, certain approaches used in special education, or tasks like administering tests for practice or other field-based assignments. But for most classroom teachers their preparation has centered on verbal learnings and/or - practical training in the classroom. Between these extremes of "sink-or-swim" experience and the vicarious study of teaching lies a large territory that is relatively undeveloped in teacher training. It is in this area that materials can play a substantial role in preparing beginning teachers and augmenting the training of the experienced teacher.

The purpose for creating materials and utilizing them in supplementing these two extremes is to provide for active participation in the training

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activity without depending so heavily on the unpredictable events that occur in the typical classroom. If materials can help organize training into a systematic plan that advances the teacher from early vicarious learning to actual classroom teaching more effectively, then the main purpose of the materials will be met. Materials have the added advantage of promoting the analysis of teaching and providing the means to conduct additional research activities. These additional advantages are not fruitful to all educational personnel equally. It is not always necessary for the classroom teacher to be knowledgeable about the research that undergirds a successful practice. It is usually sufficient that the teacher become knowledgeable and skillful in utilizing the knowledge. The burden of knowing the research that undergirds each professional act does not need to be imposed on all members of the teaching profession. In fact, one major argument favoring materials development is that materials translate research and theory into a form that has practical value for the classroom teacher. Without materials the teacher must either analyze the research findings and devise interpretations that are useful, or ignore research activity and learn how to teach from experience alone.

The case for materials development for teacher training can be argued logically and the logic holds up reasonably well. The case is simply made that (1) learning about teaching is not the same as actually teaching and, therefore, textbook learning, lectures and college classroom discussions do not constitute "training" (2) actual classroom teaching includes situations that are unpredictable, and, rely too heavily on chance factors to provide training and (3) therefore, materials that bring critical classroom events to the learner who can systematically study and acquire teaching abilities is an improvement to preparation programs. If one accepts these premises and their conclusion, then the next step into materials development makes a good deal of sense.

The task of producing appropriate materials is fraught with questions. These questions and the answers obtained through the development of Protocol Materials constitute the main substance of this book. The relationship of theory to practice through the use of materials has been the centeral purpose of the Protocol Material Program. The rationale and other considerations that clarify this relationship form the foundations on which Protocol Material development is based. The explanation of this linkage is provided in Chapter VIII.

The work completed in the production of Protocols, the training of personnel in their production and use, and the evaluation of results represents a beginning not an end. This beginning has been encourging but continuation of this initial work is necessary to more fully capitalize on the progress that has been made. A discussion of the future and potential impact of Protocol Materials is provided in the final chapter. The remaining portion of this Introduction explains the approach and rationale for materials production as undertaken in the development of Protocol Materials, and foreshadows the remaining chapters in this book.

Why Protocol Materials?

The purpose of Protocol Materials is to enable the teacher to observe and interpret events and behavior. In contrast to training materials which help the teacher acquire skills and performances, Protocol Materials help the teacher obtain useful conceptual knowledge. This distinction can be made by considering that teacher acts are based on the teachers assessment of the conditions observed and the teacher's repertoire of behaviors to act. If the teacher misinterprets conditions then inappropriate teacher behavior will result unless the treatment is so generalizable that chance alone results in proper treatment. If the teacher interprets the condition correctly but lacks the skill or knowledge to deal effectively with the condition, then the teacher is lacking in needed teaching skill. Conceptual knowledge and performance skills are both essential for effective teaching.

The teacher who is unable to classify conditions because the cues in a situation do not communicate or the teacher is unable to interpet them properly is a teacher who lacks diagnostic knowledge to cope with problems. Protocol Materials are designed to increase the conceptual and diagnostic ability of the teacher. Training materials, are designed to help teachers obtain skills of performance.

The distinction between protocol and training materials becomes blurred under certain conditions and the effects of using one type of material may have a peripheral or even central effect on the other. Nevertheless, at the development stage, the distinction is important to make. At the use stage, some materials may serve both purposes. Some teachers who work with Protocol Materials may improve in teaching skills as a direct result of the Protocol Materials. Additionally, those who acquire a new skill through training materials may also sharpen the conceptual knowledge that underlies the skill acquired. Despite this potential overlap the developer must know which materials he is developing during production of materials and the user should be clear on their intended results.

Organization of the Program

A Protocol is a record of behavior. That record might be print, audio-tape, video-tape, film, or other media. The principal concern in recording the behavior is that the behavior should exemplify a concept that helps teachers interpret episodes they encounter. The question of criteria for selecting behavioral events is paramount in the development of Protocol Materials. There are two categories of criteria to be considered and are implied in the following two questions:

1. Within what parameters should behavior be recorded?
2. What sources of knowledge should be used to identify behavior for production of material?

In this program a matrix was established that defined the parameters within which Protocols might be developed. Figure 1. provides the pedagogical plan from which subsequent matrices were derived.

The pedagogical plan is a coordinate system comprised of three generic categories: setting, level, and behavior. These terms are defined later, but for immediate purposes "setting" refers to the context in which behavior occurs, "level" stands for the stage of a person's general development, and "behavior" for observable activities. Figure 1 depicts the master system which is described in detail in the pages following.

In order to indicate the various types of Protocol Materials that can be developed in accordance with the Master Plan, it is necessary to derive subordinate coordinate systems. These are set forth after the Master Plan has been presented. The categories and sub-categories in the system below are purposely general. The lack of a high degree of specificity under the category "Teacher-Pupil" or sub-category "Instructional: Skill", for example, allows the developer a high degree of flexibility in deciding upon the specific behaviors he wishes to record. It should be remembered that the categories are intended to help assume an adequate coverage of settings, behaviors, and levels in the Protocol Materials to be developed. They are not intended to be a framework for interpretation or dissemination.

The developer could enter the matrix and select the cell within which development might occur. The matrix achieved the important task of mapping the potential area for protocol development but it did not prioritize any cells within it. The decision was made that the classroom setting would be the most important setting for the development of materials with the limited resources available initially. The classroom setting had the most potential direct payoff.

The limits described in Figure 1 were supplemented with subordinate coordinate systems in which the sources of behavior were each separated from the prime matrix and sub-matrices in which three different sources of behavior were provided. This resulted in Figures 2, 3, and 4, namely, types of behavior. This expansion of the prime matrix allowed the developer to continue the selection process by focusing on the type of behavior as well as the source, setting and level.

1. Definitions

The major categories are named in Figure 1. We shall first define the kinds of settings, then the kinds of levels, and finally the sorts of behaviors.

A. Settings. We shall use the term "setting" to designate the context from which the Protocol Material is taken.

(1) Classroom. Any room in a school building in which the activities carried on are intended to promote learning, or more generally, any place where the activities are conducted with that intention.

(2) School. Any establishment for teaching and learning.

(3) Peer Group. A number of individuals of approximately the same age forming a recognizable unit either in school or out.

(4) Family. Any group made up of parents and their children.

(5) Community. The people who live in a district or city under the same laws and institutions.

B. Levels. We shall use the term "level" to refer to the periods or phases of a person's growth from birth to adulthood. It is assumed that the developer may wish to focus on certain "types" of children or adolescents such as emotionally disturbed or mentally retarded.

(1) Early Childhood. The period from infancy to the time the child begins school.

of knowledge. Each sub-plan will be presented in the form of a coordinate system comprised of three dimensions.

PEDAGOGICAL PLAN

→(Insert) The pedagogical plan is a coordinate system comprised of three generic categories: setting, level, and behavior. These terms are defined later, but for immediate purposes "setting" refers to the context in which behavior occurs, "level" stands for the stage of a person's general development, and "behavior" for observable activities. Figure 1 depicts the master system which is described in detail in the pages following.

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(2) Middle Childhood. The period between early childhood and the beginning of adolescence. Roughly the elementary school years.

(3) Pre-Adolescence. The transition period between middle childhood and the adolescent period. Roughly the junior high school years.

(4) Adolescence. The period immediately preceding adulthood. Roughly the high school and early college years.

(5) Adult. Post-adolescent years.

C. Sources of Behavior. We shall use this expression to refer to the observable actions of a person, verbal and non-verbal.

SUBORDINATE COORDINATE SYSTEMS

1. How the Sub-Cells Were Derived

The subordinate systems in Figures 2, 3, and 4 result from expanding each of the behavior categories in Figure 1 while leaving the "setting categories" and the "level categories" unanalyzed. In Figure 2, category P has been expanded into behaviors that allow the development of protocol materials to show the social, personal, and cognitive development of pupils. In Figures 3 and 4 respectively, categories Tp and T have been expanded into kinds of teacher behavior. Figure 3 represents a model in which teacher-pupil behavior is included while Figure 4 represents teacher behavior as he interacts with peers and others.

2. Definitions

The definitions of "levels" and settings" and their sub-terms for Figures 2, 3, and 4 are the same as the definitions of these terms and sub-terms for Figure 1.

Figure 2

Expansion of P Category for all Settings and Levels

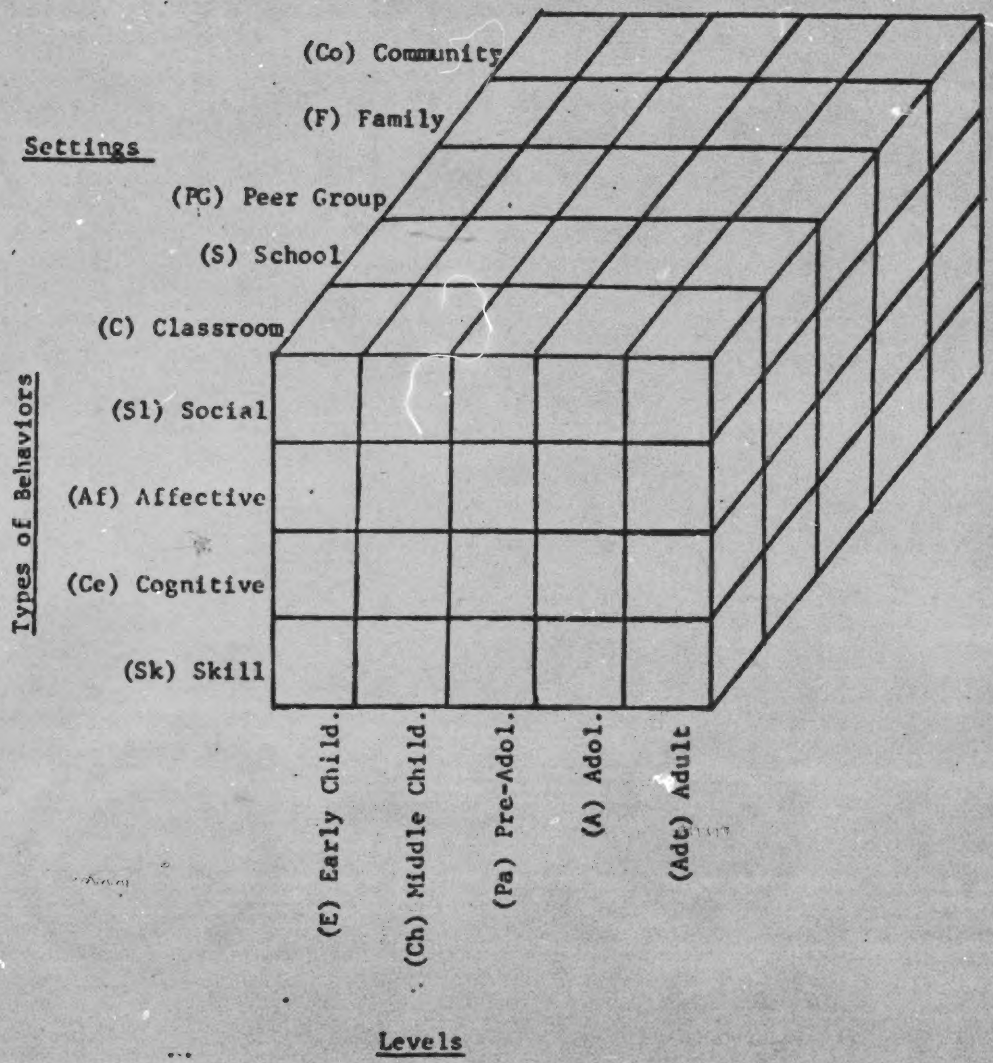

Settings
(Co) Community
(F) Family
(PG) Peer Group
(S) School
(C) Classroom
Types of Behaviors
(Sl) Social
(Af) Affective
(Ce) Cognitive
(Sk) Skill
(E) Early Child.
(Ch) Middle Child.
(Pa) Pre-Adol.
(A) Adol.
(Adt) Adult
Levels

Figure 3

Expansion of T-P Category for all Settings and Levels

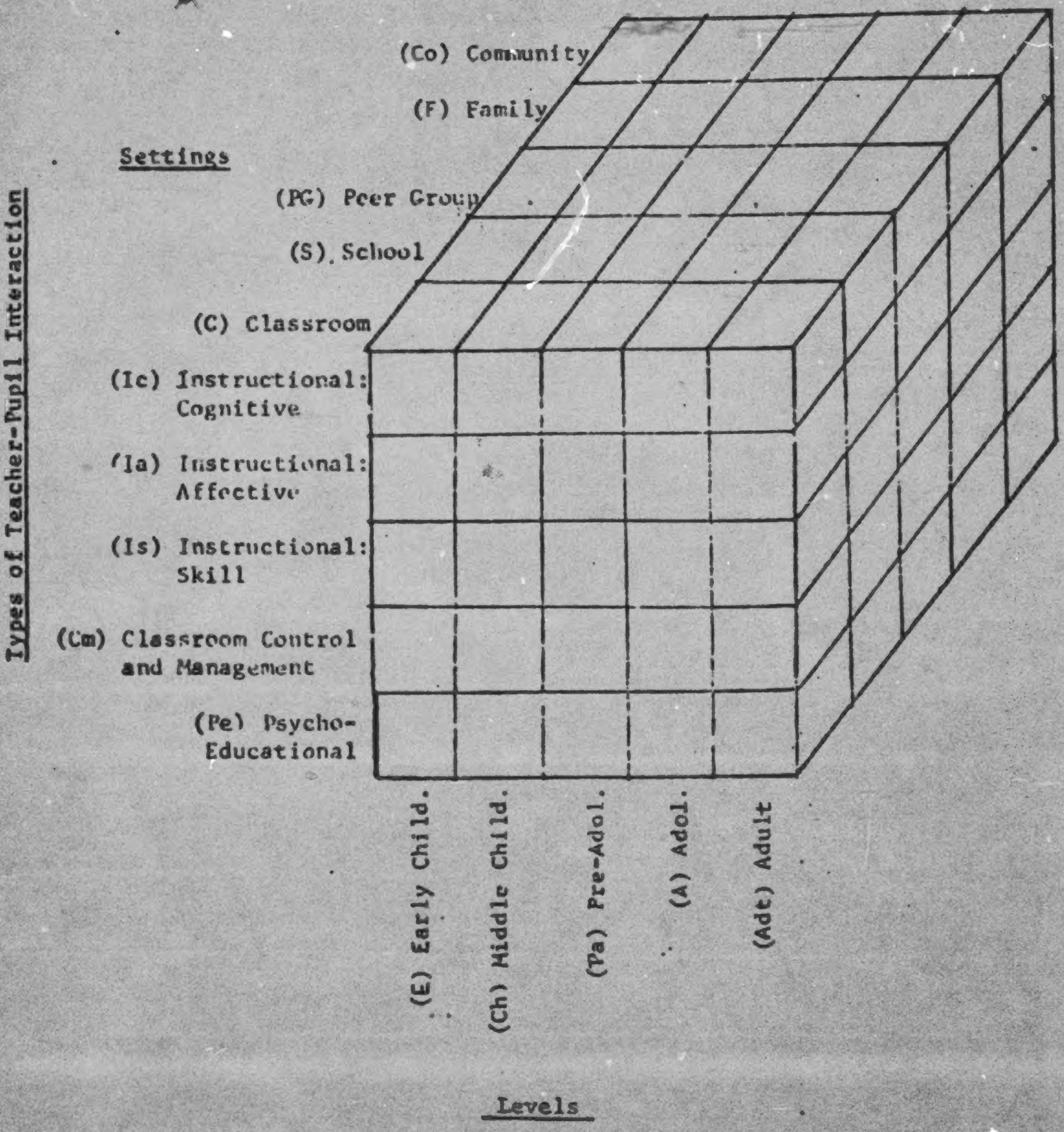
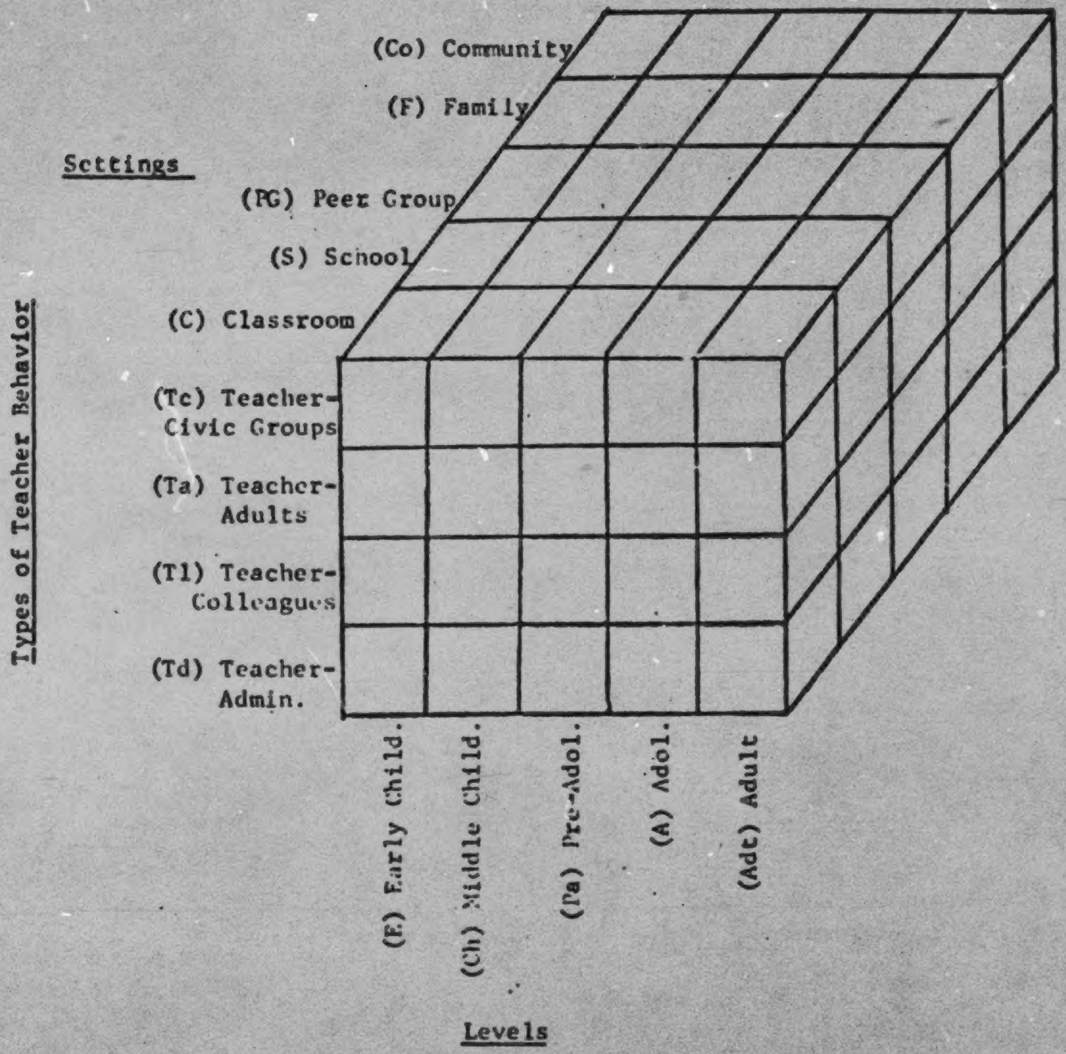

Settings
(Co) Community
(F) Family
(PG) Peer Group
(S) School
(C) Classroom
Types of Teacher-Pupil Interaction
(Ic) Instructional: Cognitive
(Ia) Instructional: Affective
(Is) Instructional: Skill
(Cm) Classroom Control and Management
(Pe) Psycho-Educational
(E) Early Child.
(Ch) Middle Child.
(Pa) Pre-Adol.
(A) Adol.
(Adt) Adult
Levels

Figure 4

Expansion of T Category for all Settings and Levels


Settings
(Co) Community
(F) Family
(PG) Peer Group
(S) School
(C) Classroom
Types of Teacher Behavior
(Tc) Teacher-Civic Groups
(Ta) Teacher-Adults
(Tl) Teacher-Colleagues
(Td) Teacher-Admin.
(E) Early Child.
(Ch) Middle Child.
(Pa) Pre-Adol.
(A) Adol.
(Adt) Adult
Levels

(2) "Affective behavior" refers to pupil behavior in the areas of motivation, valuing, commitment, personal choice, etc.

(3) "Social behavior" refers to pupil behavior characterized by such processes as social cooperation, competition, authority relationships, etc.

(4) "Skills" refers to such cognitive or psycho-motor behaviors as spelling, penmanship, typing, woodworking, gymastics.

B. Types of Teacher-Pupil Interaction in Figure 3

(1) Instructional: Cognitive--Interactions in the cognitive realm, such as conveying information, building concepts, explaining, disagnosing of difficulty in understanding.

(2) Instructional: Affective--Interactions in the affective realm, such as motivating, attitude formation and re-formation, influencing techniques.

(3) Instructional: Skill--Interactions in the realm of cognitive skills (such as word analysis, spelling) and physical--coordinative skills (such as typing, woodworking, gymastics).

(4) Classroom Control and Management--Interactions involving classroom control and discipline, especially social and physical control.

(5) Personal-Social Development--Interactions involving personal development of pupils in such areas as responsibility, personal concerns, social relationships.

C. Types of Teacher Behavior in Figure 4

(1) The expression "Teacher-Civic Groups" refers to the behavior of one or more teachers in community groups where educational policies, programs, etc., are being considered: parent-teacher groups, open sessions of Boards of Education, special interest groups, etc.

(2) "Teacher-Adults" is used to refer to the behavior of a teacher in conference with a parent, or other adults of the community about the education and welfare of pupils.

(3) "Teacher-Colleagues" refers to teacher behavior in situations involving other teachers, school psychologists, social workers, or counselors where pupil problems, school programs, etc., are being considered.

A. Types of Pupil Behavior in Figure 2

(1) "Cognitive behavior" refers to the behavior of pupils that entails the process of knowing, preceiving, conceptualizaing, inferring, classifying, etc.

(2) "Affective behavior" refers to pupil behavior in the areas of motivation, valuing, commitment, personal choice, etc.

(3) "Social behavior" refers to pupil behavior characterized by such processes as social cooperation, competition, authority relationships, etc.

(4) "Skills" refers to such cognitive or psycho-motor behaviors as spelling, penmanship, typing, woodworking, gymastics.

B. Types of Teacher-Pupil Interaction in Figure 3

(1) instructional: Cognitive--Interacions in the cognitive realm, such as conveying information, building concepts, explaining, disagnosing of difficulty in understanding.

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C. Types of Teacher Behavior in Figure 4

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(3) "Teacher-Colleagues" refers to teacher behavior in situations involving other teachers, school psychologists, social workers, or counselors where pupil problems, school programs, etc., are being considered.

Provision also was made for Protocols to be developed in the basic fields of knowledge. Another matrix was created that included the age levels in the prime matrix but the other two dimensions included Types of Knowledge on the one hand, and Areas of Knowledge on the other. This combination of matrices provided parameters within which initial choices could be made by the developer. Figure 5 provides the matrix for the basic fields of knowledge.

The term "basic fields of knowledge" is used to refer to all subjects of instruction except those in Education. It covers vocational and technological subjects, arts, and the conventional disciplines such as physics, history and mathematics. The plan set forth here provides for the development of Protocol Materials to teach certain things, not ordinarily taught in college courses, about the content of these subjects. For example, the content of a course in history may be biased against a minority group or it may be composed of certain elements of knowledge--concepts, values, generalizations--and yet the teacher-in-training may miss these aspects. The development of Protocol Materials will help to provide instruction in these neglected aspects of the subjects of instruction.

The basic-fields-of-knowledge plan is a system of coordinates made of three generic categories: Areas of Knowledge, Levels, and Types of Knowledge about Knowledge. Figure 5 represents this system of coordinates. The expressions used in Figure 5 are defined below:

1. Definitions

We shall give the uses of the expression "Areas of Knowledge" and "Types of Knowledge about Knowledge" and then define the terms designating the sub-categories.

A. Areas of Knowledge. This expression is used to refer to the various classes of arts and sciences. (Over 350 subjects are offered in the public schools.) To represent these in a three dimensional grid requires that they be reduced to a few categories. This is attempted in the following definitions adapted from Tykociner's Outline of Zetetics (1966).

(1) Symbolics. This is an area of knowledge that includes language arts, mathematics, and logic.

(2) Arts. This term is used to refer to the area that includes dramatics, graphic arts, music, painting, sculpture, literature, industrial design, choreography, and architecture.

(3) Science of Matter and Energy. This group is made up principally of physics and chemistry but it also includes astronomy, geology (earth science), and mineralogy all of which are unified by the principle of equivalence of matter and energy.

(4) Biological Sciences. This group treats living things, as exhibited in growth and reproduction. It includes botany, zoology, morphology, genetics, and cytology, and is related to 3 above by biophysics, and biochemistry, and to psychological sciences by physiology.

(5) Psychological Sciences. This term is used to refer to the sciences of behavior of living things. It includes principally individual psychology, group psychology, and social psychology.

(6) Sociological Sciences. This group includes the sciences which deal with the various facts about, and forms of, group life--demography, geography, social institutions and ethnology, and is related to the historical studies by anthropology.

(7) Developmental Sciences. This group is comprised of those disciplines which are concerned with the past, including cosmic evolution and history and pre-history of cultures. Among these are cosmogony, certain aspects of geology and biology, and the history of mankind.

(8) Sustaining Sciences. The aim of all these studies is to maintain life and to advance its welfare. This group includes health, physical education, public hygiene, and, at a more sophisticated level, agriculture, medicine, engineering, and technologies (manual arts, home economics, metal working, and other vocational subjects).

(9) Regulative Sciences. These are the areas of knowledge that are concerned with sustaining cooperation among men as they strive to satisfy their individual and collective needs. They attempt to keep the various elements of society adjusted to one another. Among these sciences are economics, political science, jurisprudence, and management (business education).

(10) Disseminative Sciences. This group includes those sciences which are concerned with the task of transmitting information accumulated from generation. Among these are library science, pedagogy, and journalism.

(11) Integrative Sciences. These studies attempt to bring knowledge to bear upon such questions as consistency of knowledge, man's purpose, and his destiny. Among these disciplines are philosphy, theology, and ideologies.

B. Levels. This term has been defined on page 41.

C. Types of Knowledge about Knowledge

(1) Kinds of Knowledge. This term refers to the epistemological elements of instructional content such as laws, concepts, rules, values, procedures, and facts.

(2) Logical Operations. By this expression is meant logical relations and such operations as defining, explaining. classifying, and valuing.

(3) Types of Biases. This term refers to adherence to a point of view in the selection and interpretation of the content of instruction. (In some cases the point of view may be socially neutral as in the so-called new math or in the different approaches to biology, chemistry, and physics. In other cases it may be socially deleterious. For example, biases about races, social classes, labor, management, and the like can be injurious to the well-being of certain groups or to the public welfare.)

(4) Types of Utility. This expression refers to the uses to which the various kinds of knowledge and logical operations can be put by pupils and adults as they carry on the normal activities of life. For example, knowledge may be used in repetitive, associative, applicative or interpretive ways or in making decision or in justifying actions.

✓

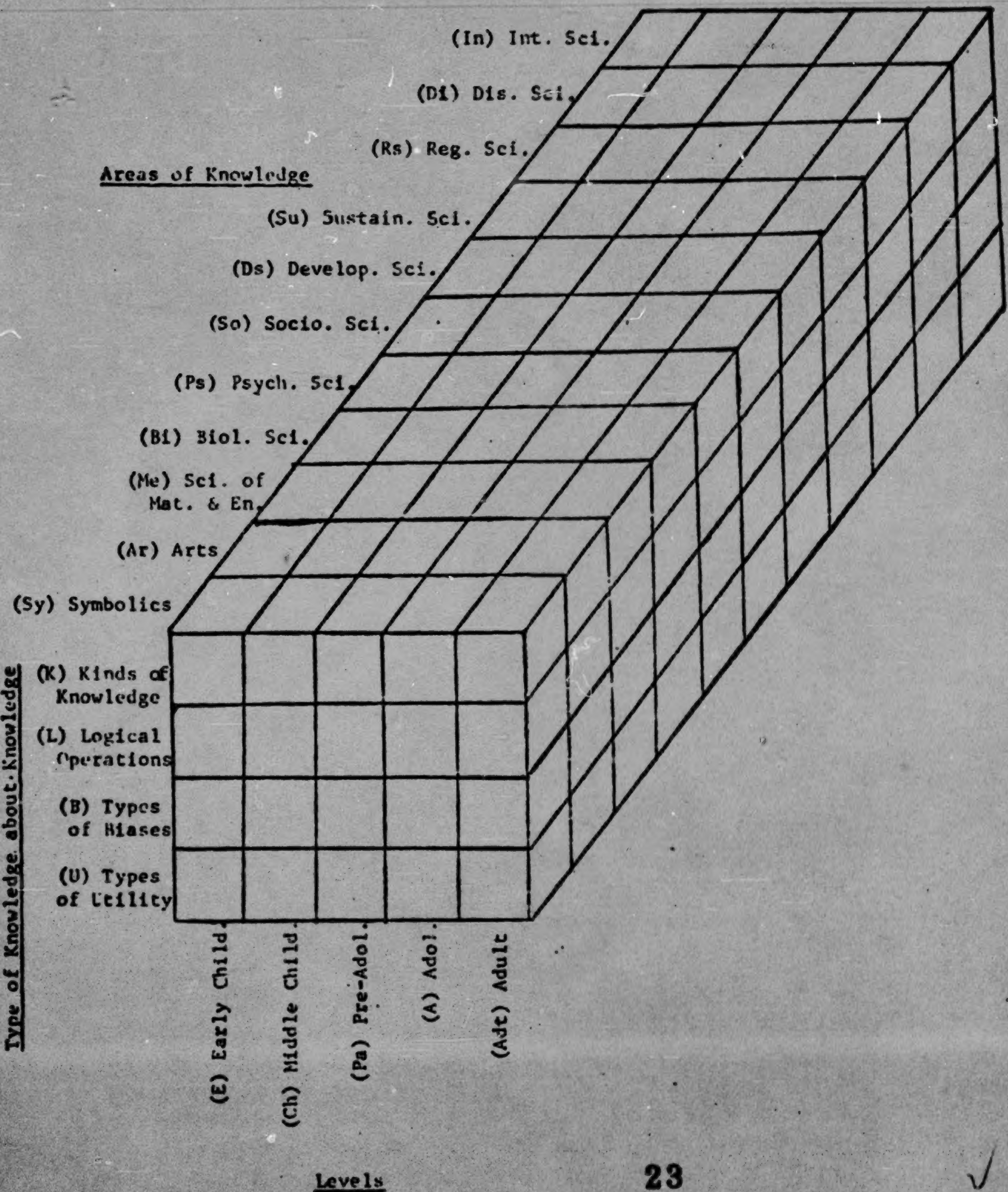
2. Settings. It should be noted that the "setting" category has been replaced in the basic fields schema by the category-- "Areas of Knowledge." This means that no settings are indicated for the development of Protocol Materials in Figure 5, for "Areas of Knowledge" are not settings but realms of content.

In what settings may materials concerned with the content of instruction be developed? A few settings are suggested here as examples. Some may be taken from the classroom. Others from public school text-books, and still others from newspapers, magazines, and radio and television broadcasts. For example, Protocol Materials to show the utility of certain elements of scientific knowledge may be taken from articles in newspapers where such knowledge is being used. The analysis of the Protocols would attempt to show how the knowledge is used in an article as well as how the reader uses his own knowledge as he reads it. Similarly, Protocol Materials to depict elements of knowledge--concepts, values, generalizations, etc.,--in history may be taken from classroom discourse where the content of history is being discussed. The analysis of the Protocols would help the teacher-in-training to identify the elements as they appear in teacher-pupil interaction.

3. How to Interpret the Basic Fields of Knowledge Plan. Protocol Materials developed to show how economic knowledge studies in high school is used in out-of-school life are placed (Figure 5) in cell RsAU. Similarly materials that are to be used to show the racial biases of classroom discourse in a juhior high school course in history are placed in cell DsPaB. If Protocol Materials are developed to show the elements of knowledge in elementary school geography, they would be located in cell SoChK. Other materials can be distributed in their proper cells by reference to the various categories in Figure 5.

Figure 5

Master coordinate System of Areas of Knowledge, Knowledge about Knowledge and Levels



Areas of Knowledge
(In) Int. Sci.
(Di) Dis. Sci.
(Rs) Reg. Sci.
(Su) Sustain. Sci.
(Ds) Develop. Sci.
(So) Socio. Sci.
(Ps) Psych. Sci.
(Bi) Biol. Sci.
(Me) Sci. of Mat. & En.
(Ar) Arts
(Sy) Symbolics
Type of Knowledge about Knowledge
(K) Kinds of Knowledge
(L) Logical Operations
(B) Types of Biases
(U) Types of Utility
(E) Early Child
(Ch) Middle Child
(Pa) Pre-Adol.
(A) Adol.
(Adt) Adult
Levels

(7) Developmental Sciences. This group is comprised of those disciplines which are concerned with the past, including cosmic evolution and history and pre-history of cultures. Among these are cosmogony, certain aspects of geology and biology, and the history of mankind.

(8) Sustaining Sciences. The aim of all these studies is to maintain life and to advance its welfare. This group includes health, physical education, public hygiene, and, at a more sophisticated level, agriculture, medicine, engineering, and technologies (manual arts, home economics, metal working, and other vocational subjects).

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(2) Logical Operations. By this expression is meant logical relations and such operations as defining, explaining, classifying, and valuing.

(3) Types of Biases. This term refers to adherence to a point of view in the selection and interpretation of the content of instruction. (In some cases the point of view may be socially neutral as in the so-called new math or in the different approaches to biology, chemistry, and physics. In other cases it may be socially deleterious. For example, biases about races, social classes, labor, management, and the like can be injurious to the well-being of certain groups or to the public welfare.)

From the preceding figures it is apparent that the developer had considerable latitude in selecting concepts in the pedagogical domain or in the basic fields of study. He/she had further choices about the setting in which the behavior should occur, the age level to utilize in the portrayal of behavior, the source and the type of behavior to illustrate. All of these preliminary plans helped answer the general question of what parameters were to be followed by the developer.

After a specific cell was selected, the developer was confronted with the task of identifying specific concepts for portrayal. As a general rule, it was expected that each Protocol would contain one concept. Thus, the developer who narrowed the choice to one cell had the task of selecting a specific concept for the Protocol. This issue is discussed more fully in Chapter 4. It suffices to say here that the concepts selected might be chosen from research findings, taxonomies, or conventional wisdom. Those concepts that are part of systems generate more power to the learner than isolated concepts. The developer should select concepts that contribute to theory or system rather than isolated concepts.

After developers have selected the cell and the concept for the Protocol, additional tasks follow. These tasks calls for naming, defining, and providing a behavioral definition of the concept. The issue of translating an abstraction into behavior is one of the most difficult problems the developer faces. This step is critical because the Protocol must portray behavior that accurately illustrates concepts. The linkage between research and practice rests heavily on the rigor of the definition of the concept and the acceptability of the behavior utilized to portray the concept. This task is further complicated by the lack of literature in the field of concept analysis and little uniformity in naming and defining concepts. The experience of the Project Directors on this problem is explained in Chapter 3 on completing the steps of selecting cells, concepts, and portraying them in Protocol Materials.

Developers of Protocols were frequently lacking in technical knowledge that would enable them to make acceptable recordings of behavior. The communication problems with film makers posed new difficulties for most developers. Standards for technical quality and a new vocabulary were two of the areas in which producers needed additional knowledge. Procedures to overcome these problems were worked out by developers and reported in Chapter 5.

Additional questions that permeated the development of materials were concerned with the ways of using Protocol Materials and their evaluation. There are practical considerations in using any materials and the factors of time and cost, as well as effectiveness were addressed. Closely related to the question of how materials can be used is the question of evaluating their effectiveness. The topics of evaluation and use of Protocols are included in Chapters 6 and 7.

Chapter II

Ruminations of a Wiser but More Skeptical Protocol Materials Director

By Judith E. Henderson Lanier

I was truly excited in 1970 when the opportunity came to apply to the United States Office of Education for a protocol materials grant. Along with several colleagues, I was renovating the basic educational psychology course at Michigan State University. One of the major problems we were attempting to solve was the chronic criticism that the course "lacked relevance." Like students at other universities and colleges, our students studied concepts that were part of the literature of educational psychology--concepts such as operant learning, respondent learning, positive and negative reinforcement. The concepts were acquired in traditional ways, through reading a text and/or listening to a lecture. It is an understatement to say that our students typically experienced difficulty in seeing what Pavlov's dog and little Albert's rat had to do with their becoming better teachers. Thus, a project enabling us to produce materials that would illustrate concepts in actual classroom contexts sounded like a powerful

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antidote to our problem. We would be able to capture a "slice of life" from a teacher's real world--actually show the teacher using concepts such as positive reinforcement and shaping. This would enable us to make the relevance obvious, and also to more adequately teach for transfer.

We had searched for means to tie psychological concepts to the "real teaching world" prior to making a grant proposal. Most of our effort had centered around getting prospective teachers into classrooms for observation. Unfortunately, this created more problems than it solved. Transportation and scheduling concerns were overwhelming for the large numbers of students for whom we had to find "good" observation sites. Even if we could have handled the scheduling and transportation difficulties, the inability to control the observation made the see-it-in-the-classroom approach highly impractical. We wanted to be sure the prospective teacher actually saw an instance of whatever concept happened to be the focus of study, instead of a movie on banana production in Central America or children at recess. We needed to capture exemplars that could be shared with all students for both illustration and discussion purposes. We needed to be sure that all students had the opportunity to experience each concept as it operates in the real world.

Thus, when a grant was awarded, we felt a marvelous sense of relief. The means was now before us--the idea, the financial support, and the necessary consultant assistance. All we had to do was produce the materials. Our enthusiasm and motivation was high--as was our naivete. For one thing, we assumed a relatively straight forward and simple task. Contact the "good" teachers in the Lansing area who already utilized the desired concepts in their teaching. Take the film crew from our Instructional Media Center to the school, shoot the needed footage, edit the material and we've got it.

Right? Sooooo wrong! Our comfortable and naive beginning was soon replaced with an uncomfortable recognition of the magnitude of both our task and our ignorance.

Capturing Visual Examples of Educational Concepts

We did begin our work just as simply as described. We contacted teachers who were generally recognized as outstanding. We had observed them and knew that they were both knowledgeable and sound practitioners. We, therefore asked permission to film their standard teaching activities for the purpose of illustrating for teachers-in-training their "use" of learning concepts. They agreed and we simply requested the film crew to capture the essence of the teachers' instructional activity. Two cameras were used. One focused primarily on the teacher; the other, on the children.

What a disappointment when we viewed the results. The teachers did not provide crisp and clear instances of the concepts we wanted. We acquired hours of footage that required days of editing, only to end up with a product that provided merely a close approximation of the concepts. A key attribute was too vague in one case, absent in another. Trucks had roared by the schools and made the sound track inaudible. Announcements had come over the public address systems in the classroom, interrupting crucial sequences. In many instances, our concepts required the passage of time (e.g., those dealing with behavior change) and it was impossible to have an entire film crew on site ready and waiting for the moment when the change would occur. We finally decided to cease our attempts to capture concepts as they naturally occurred and took our first step away from a cinema verite approach. We decided that some staging would be required to get what we needed.

Our next ill-fated set of procedures involved coaching the teachers and the film crew prior to instruction. We "taught" them the concept by explaining the key attributes we wished to capture. Interestingly enough, although a number of the teachers behaved in ways that implied knowledge of a concept, it was not unusual for them to be "using it" at an unconscious level. They were frequently not aware of the behaviors they manifested which constituted the concept. We had to raise their level of awareness, to teach the concept to others. We had to capture all of the essential elements and label them. We explained to the teachers what we needed and why, seeking to find the behavior and setting that would be natural to them. At this point we thought we had found "the way" to make protocols. But a five-hour attempt to capture several examples of one concept of positive reinforcement lead us to abandon these procedures. Our problems proved to be various and complex.

In illustrating positive reinforcement, we wanted to show that a variety of rewards was possible, i.e., we wanted to avoid limiting teachers' thinking to praise and grades alone. We therefore decided to show a teacher using various social reinforcers, secondary reinforcers and concrete reinforcers. We identified a teacher who effectively used all these reinforcers in her teaching. We selected some"natural" activities with her and then planned some "staged" scenes. The teacher and principal were most cooperative, as were the parents, who signed permission slips for their children's participation. The film crew visited the school and classroom prior to our shooting date and came prepared to work within the restraints of the sound and lighting problems. They had also been present at all sessions with the teacher. In effect, they knew the script.

For the first vignette we had the children coming in from recess, forming a natural line at the drinking fountain. Then several youngsters pushed in line and got into a squabble, followed by the teacher, who "reinforced" those who disciplined themselves well. Since the children went to lunch at 11:30, the film crew came in at 11:35 and set up the lighting, cameras, and sound equipment in the halls. With the children on the playground for the noon hour, we were able to make all necessary preparations to begin shooting when they came in at 12:30. We guided students from other classrooms around the equipment and waited until they were settled for their afternoon session before briefing our "star" class. Picking out two rambunctious boys who frequently had fights, the teacher asked them to "scrap" over who was to get a drink first. They agreed most willingly. She explained to the remaining students that the rest of the scene would be like their usual entry behavior and they were just to be themselves, and not look at the camera. The children went outside and we began.

The cameras rolled as the school doors opened and the students came in. They headed for the fountain, and the two boys pushed right on cue but then they shoved some more and soon they were really fighting. The whole thing was out of hand. Cut - Cut - Cut. "You're starting out fine boys, but you are supposed to quit eventually -- this isn't for real you know and you mustn't steal the show." We began all over. The children went outside to come in again. This time all went well, except a fuse blew about half way through and we were without lights. Cut - Cut - Cut. Time out to trace circuits. "These schools just aren't always wired for high-powered lighting. Okay kids, outside again, this will probably be our last time." Once again they came in on cue. Once again all appeared to go well. The pushing and shoving began at the fountain. The kids were doing absolutely beautifully until -- a teacher from the room across the hall opened her door and in full view of the camera asked the children to quiet down. They were disrupting her class. Cut - Cut - Cut. Again our plan was foiled. She apologized effusively and returned to her room. "Okay, kids -- outside again. What? -- it's started to rain? Well, we'll make it fast this time." We had three more takes and wet, excited kids (I won't describe the condition of the adults) before we were ready to do the second vignette in the classroom.

Children would stare at the camera when we least expected it, causing us to have to shoot a vignette over again. Children who behaved spontaneously for the first take would frequently become dull and fake when reinacting the vignette a second time. The teacher who appeared calm prior to shooting got exceedingly nervous when the film rolled; the longer the shooting progressed, the more "unreal" she became. The excitement generated by an entire class of students with many adults and lots of equipment in their classroom, in addition to the normal interruptions and demands of a school day, made filming in these circumstances nearly impossible. The frustrations were simply too numerous to recount. Thus, we moved even further from a cinema verite approach.

The third approach we tried turned out to be the most desirable, that is "most desirable" in the sense that it contained the least number of undesirable consequences. Far from an optimal solution, it proved a satisfactory one and became our approach in subsequent years.

We now begin by writing the formal definition of the concept we are attempting to illustrate. We also enumerate the necessary conditions or key attributes that must be present for the concept to be exemplified. In addition, we write many positive and negative examples of the concept. We then meet with the director and staff from our film production unit. We share our descriptive material with them and discuss the concepts we want to film and why we consider them important for teachers. We brainstorm and argue together about what constitutes the best means of illustrating the concepts. Then our staff prepares an explicit first-run script. On the left of each page is a detailed description of the visual stimuli we would like to see in the film. On the right side is the auditory stimuli we consider important. This first-run script is sent to the filming staff. They study our recommendations and make whatever modifications they think are needed. In some instances, a script will be totally revised, while in other cases only minor changes will be made. The second-run script is then returned to us and we study all suggested revisions. Meetings are held to work out the differences of opinion that remain. From these efforts of the instructional staff and the filming staff, a synergistic third-run is prepared. Next, this script is taken to a selected sample of classroom teachers for their reaction. They are asked to critique the script in terms of the planned illustrations. Their comments are given consideration and changes in scripting often occur as a result of their insights. When these last steps have been taken and our staff finally approves the scripts, we prepare to film the vignettes.

Arrangements for acquiring shooting sites and "actors," i.e., selecting schools, teacher and children who will participate, are made by the technical staff. All filming is done on the weekends when regular classes are not in session. Screen tests are held for the "actors." Utilizing the scripts, lights, and unloaded cameras, the staff has students and teachers enact the planned sequence in the actual setting. Actors are then selected and filming dates established. Although we are obviously unable to capture sequences of acting rivaling commercial television, we have been able to film behavior that appears spontaneous--at least compared to the less carefully planned or less structured approaches we tried earlier.

One important additional point relates to the extent we are bound to follow the prepared scripts. We do not follow them exactly, since there are no memorized lines. The actors read the scripts and then discuss them with the director. The director in turn helps them understand the central notion(s) we are after. They are encouraged to use their own words and express themselves naturally as if they were in a situation of the sort described. Since the director understands the concepts we are after, he is able to judge when a deviation would be helpful and when it might change the intended meaning. This flexibility has encouraged spontaneity. This spontaneity, in turn, facilitates the realistic quality of the vignettes. Thus, the protocol films we have produced are not actual slices-of-life, but are films of concepts as they might be illustrated in real life.

Embedding the Films into Concept-teaching Units

The problems encountered in capturing visual examples of concepts were various and numerous. The developmental steps required the preparation of instructional units into which the protocols might be placed for optimal teaching of concepts. This second step brough further problems and trial-error learning.

The "instructional whole" aspect of protocol materials is often overlooked since the primary focus typically centers on the film production. But the goal of the protocol project was not simply to develop films; it was to teach concepts in a more powerful manner to teachers. Thus, concept learning was the goal; film production (the preparation of visual exemplars) was a partial means. The assumption is false that all there is to protocols is films. The films are a central part of protocols but written materials which accompany the films represent a significant portion of numerous projects. The development of these printed materials raises additional questions and problems regarding the teaching of educational concepts.

We began our instructional planning with the commitment to apply what we believed to be effective methods in concept learning. We believed in the evidence that it was important to use numerous positive and negative examples of the concepts. We also trusted evidence that supported the use of advance organizers and the highlighting of key attributes. Similarly, we believed that students would need practice in making the discriminations they would have to make to recognize the concept in a variety of settings. Thus, it was with these "biases" in mind that we designed our first set of protocol materials. Our subsequent developments followed a similar format, except that after our first trials, decisions were based on the empirical data collected through research and evaluation of the initial set.

Let me now describe our usual format in more detail. We begin by selecting concepts that are conceptually related to one another. Our first set, for example, centered around various concepts of learning. Our second set centered around the common domain of universal teaching tasks. Our third set clustered around the interpersonal communication areas of feedback.

Taking a set of interrelated concepts, we begin by describing (1) the manner in which the concepts are related to each other, and (2) how the cluster of concepts is related to the decisions and actions of teachers. We formally define each of the concepts and enumerate key attributes. Numerous examples of each concept are collected. All of this is written and organized into a "conceptual overview," or advance organizer.

Next we prepare a brief instructional lesson on each of the concepts that is being taught. Each lesson contains a restatement of the definition and the conditions that must be accounted for if the concept is to be considered present. In the written lessons are opportunities for students to make judgments about the presence or absence of the concept and to receive feedback about the accuracy of his or her judgments about the attributes. When a student has had sufficient practice with the written description, which are, verbal simulations, he is ready to move to the more difficult next step, which is to practice making discriminations on film. Typically, our students view the protocol films after they have read the accompanying protocol text.

There has been some discussion among the various Protocol Directors about the efficacy of this approach. Some feel the visual messages should stand alone and carry the entire burden of instruction. The primary argument given for this stand is that users often ignore the written materials and utilize only the more interesting and unique aspects of film. There is a fair amount of evidence to substantiate this phenomenon. However, if advance organizers are helpful, and if numerous positive and negative instances do facilitate concept acquisition, it is not possible to provide all of this through films that are being produced on a limited budget. Quite simply, sufficient funds were not available to produce on film the amount and kind of information that is necessary for providing all the instruction needed for concept acquisition.

We studied, the effects of providing students filmed examples with accompanying study guides, with and without the conceptual overview. Those who had studied the conceptual overview mastered the concepts with a significantly greater degree of success. It was because of these research and evaluation results that we have followed the practice each year of preparing a conceptual overview to accompany the filmed sequences.

It does appear reasonable, however, that (1) if adequate funds were available, and (2) if we find that users ignore written portions of protocols, we might decide to present through film the essence of what is presently contained in the written materials. But with empirical evidence that supports the need for advance organizers and numerous positive and negative examples, and with a budget that allows production of only a limited number of examples, we have continued to stress the importance of the accompanying written protocol materials, as well as the audio-visual materials.

I have described the general procedures we follow and the rationale for our approaches as we have produced protocol materials at Michigan State. Let me now discuss some of the specific nagging problems and questions we have faced and still face as we produce protocol materials. My remarks will be organized around the major phases required in protocols development. These are: (1) the concept selection, definition and specification tasks, (2) the materials production tasks and (3) the evaluation tasks.

Concept Selection, Definition and Specification

Selecting concepts has been a "hot topic" among the Protocol Directors and LTI members since our first meeting. We discussed, ad infinitum, such questions as "how does one determine which concepts are important for teachers? How does one decide which important concepts should be visualized and which should be taught through less expensive formats? Must concepts be conjoining in the sense that they are intellectually related to one another in some logically cohesive way? If one selects a cluster of concepts, how many of them can be supported with visual materials when the maximum budgets are really quite minimal?" The range of responses to these questions has been extreme in its diversity.

Some directors initially saw little difference between concepts and principles, or between concepts and skills. Others were primarily interested in capturing interesting film sequences of classroom behavior and letting the audience pick and discuss concepts they happened to see in the film. Some directors and LTI members wanted concepts illustrated that were prevalent in existing educational literature. Others felt that Project Directors should be free to construct their own concepts. Some recommended that only concepts be selected that teachers could use directly in the classroom. Various recommendations were made by those connected with the protocols program concerning the nature of the concepts and how they should/could be defined, but the individual directors retained relative autonomy in the final decision making.

At Michigan State we spend a large amount of time in the concept specification phase. We have consistently selected concepts that our existing course evaluation results tell us that teachers and/or prospective teachers are not learning well. We begin our considerations by re-examining the nature of the concept(s) and its relevance to teaching. If we see it as important and central to effective teaching we proceed to examine potential weaknesses in the instructional strategies being employed. If existing strategies do not appear to be any less sufficient than in those cases where students are successfully acquiring the concepts, we reason that a protocol might provide the additional support to "make the difference." We then do an extensive review of the literature, collecting and studying the various ways in which the concept(s) has been defined--there is usually a variety to select from. As a staff, we argue and debate the pros and cons of the various definitions, and eventually select the one having the most favorable consequences in terms of intended and potentially unintended meanings. Following this, we identify necessary conditions; a difficult task when you are working with "family resemblance" concepts which have attributes that are typically present, but are not necessarily essential unless other conditions are present.

As one persists with this task, it is not unusual for headaches to increase in direct proportion to the increase in ambiguity stemming from the complexity that develops. When the confusion settles and sufficient stability emerges, each staff member writes a set of illustrations of the various concepts. The individual illustrations are then shared with the staff and become the first test of the adequacy of the definition. Each illustration is judged for its consistency with the necessary conditions that were identified earlier. These concept examples are also critiqued for their eventual incorporation into either the written or visual materials to be produced. We also begin to develop criteria for the total set of examples. How many men and how many women should be represented as teachers? Do we want various ethnic groups represented? What age levels of children should be included? How much variety is needed in contextual setting; that is, should all illustrations be in classrooms or should the concepts be illustrated in other settings as well?

Another concern is the generation of non-examples to be illustrated. We have found that it is important systematically to vary the key attributes that are absent in the non-examples, for if this is not purposefully done, one finds that the non-examples are frequently of one type, i.e., they consistently lack the same key attribute.

Throughout the time we wrestled with conceptual questions and problems, and while we developed the procedures just described, we were assisted by members of the LTI. National meetings were held several times each year where LTI members and protocol directors were present. Regional meetings were also held and LTI members made site visits. While these sessions were somewhat helpful, they more often resulted in a clearer picture of the problems rather than in a clearer picture of potential solutions. This is not meant to be critical of the persons involved, but only to point out the newness of the territory we were exploring. Protocol Directors and LTI members had few precedents to draw upon and our time together was almost too brief to establish common understanding of the difficulties being encountered at the moment. In any case, our conceptual efforts to date have been very "trying" in the dual sense of the word. At Michigan State we have come to be relatively satisfied with the procedures we follow, although there remains a disparity of opinion nationally among protocol producers as to how to go about the concept selection, definition and specification task. For this reason, the procedures I have described are not necessarily representative of the approaches used by others.

Materials Production

This second phase of protocol development is similar to the first, in that there appears to be little consensus about the best approaches to follow. Many of the problems we encountered were described earlier in this chapter, so I will add just a few of the additional procedures we follow in attempts to avoid further problems.

As stated earlier, the written materials we produce include a conceptual overview and individual film guides. In preparing the conceptual overview, we introduce all new terminology by initially pairing the new terms with common words or phrases that are probably in the student's existing vocabulary. We gradually move away from using the support terms and phrases as the overview progresses. We also spend considerable time illustrating the importance and centrality of the concept to a teacher's performance in the classroom. These two steps are related to our concern for the affective, as well as the cognitive outcomes of our student's study.

In the film guides, we highlight the key attributes by treating each of them individually and providing a supporting rationale for each discrimination the student is asked to make. We do not want students to view the discrimination tasks as exercises in arbitrary memorization.

During our first year, we prepared half of our guides with an inductive format and half with a deductive format. The research results from that year indicated no significant differences, either in terms of concept acquisition or affective preference. We subsequently prepared all the guides and, try them out on three sample sets of students, prior to submitting them to formal evaluation and field test procedures. Each set of students gives critical reactions and we revise the prototypes based on their suggestions. No matter how clear and straightforward first drafts appear to be, students always find loopholes and omissions. We have found their critical feedback and questions to be extremely helpful in guide preparation.

After producing the first year's protocols, we also learned of another set of persons from whom we whould seek critical feedback. When writing examples that contain instances of a particular content, a subject matter specialist should be consulted about the methodology that is being described. Although a film is meant to illustrate a concept, viewers typically interpret the teacher behavior being illustrated as prescriptive. We produced a filmed vignette, for example, that showed a teacher teaching a math lesson. The concept being taught was respondent learning and it showed the teacher pairing the challenge and playfulness of games with the acquisition of addition facts. The gaming was good, but toward the end of the vignette, the teacher had the students turn to the back of their books and begin writing the fact problems and answers. Although the film illustrated respondent learning rather well, it caused the rancor of mathematics educators who thought the methodology employed in the final portion of the film was atrocious. They forgot what concept the film was meant to teach and centered on the apparently powerful distractor. And they were right! We had indeed show some badly outdated math teaching. Thus during the first year we learned to seek reaction and critisism from subject matter specialists as well as students. Though we can never "please all of the people all of the time," we can significantly decrease the obvious errors and distractors by seeking critical feedback prior to actual shooting and/or final printing.

Another problem we dealt with concerned the number of examples students need to master recognition of the concept. Some request more examples while others report they are burdened with the task of reading through too many. Thus, we moved to the practice of providing a moderate number of examples in the body of the overview and guides and appending additional practice illustrations for those who prefer more examples.

Another problem relates to the readiness level of learner populations. In field testing our first year's work with students from another university, we found that they experienced difficulty with the materials because they had evidently not acquired some essential prerequisite concepts. They reported having difficulty with the concept of positive reinforcement because one of the key attributes was "behavior," i.e., the student had to "emit a behavior." Not having dealt with the concept of what constituted a "behavior" beforehand, they had problems, since our material assumed prior understanding of this concept. We have since tried to anticipate problems of this sort and incorporate appropriate instruction into our overview section.

We selected visual media as the best means of illustrating our concepts because all of our concepts contained both verbal and non-verbal behavior. We selected 16mm film because it would have the widest dissemination capability and problems of compatibility with video-tape recorders could be avoided. We used black and white film our first year because of budgetary restrictions, but moved to color in the remaining years which our film director encouraged and helped support. The sound problems we experienced in our early years were solved through the use of carpeting and a new microphone and sound system. The early technical problems we experienced have been adequately resolved. The problems that remain are more related to adequate exemplification of the various concepts.

The crucial factor in continuing to improve appears to be that of listening to the critiques and the results of one's evaluation and field testing. A major frustration in our development efforts has been the lack of adequate time and funds to improve upon the "finished" products. Evaluation and field test results for a year's work come in and are analyzed just about the time we are engaging in the early tasks of producing a new set of materials for the ensuing year. We have been able to revise and improve our written materials, but have not engaged in revision of our films. There are some projects, however, that did take a second year to make improvements and prepare revised sets of visual materials. Given that we have learned how to avoid major errors, however, the need for gross revision should be minimal in the future.

Evaluation and Field Testing

In some ways we have learned less about evaluation and field testing in our years of protocol experience than we have about concept definition and materials preparation. Numerous questions still remain with little data for optimal answers. Let me describe the evolution of our evaluation concerns.

In our first two years of protocol productions, we examined the effect of the materials on students' (1) concept acquisition, (2) transfer of the concept to a simulated teaching situation, and (3) attitude toward the usefulness of the concept in a teaching context. Each year, our evaluation was undertaken in a carefully controlled but natural university setting involving over 600 prospective teachers. Students were randomly assigned to diverse instructional treatments designed to assay the effect of the protocol materials as compared to the standard written and spoken instruction on the same concepts. In the first year, we also investigated the influence of written introductory material on the subsequent acquisition of a related concept, and the differential effects of using either an inductive or a deductive method of instruction. In both of these years, there was strong, clear evidence from the analysis of the data that the protocol materials aided in superior concept acquisition, transfer, and positive student attitude toward the concepts.

We tested students' acquisition of concepts by having them identify the presence or absence of concepts when imbedded in written simulations of teaching situations. Thus, we were not testing whether or not the students would be better able to recognize the concepts in real classroom situations, or even in filmed segments of "real" classroom situations. In our first year we found that on written tests of concept acquisition, the increase in student performance attributable to the protocol materials ranged from 69% to 88%. On written tests of students' ability to select and recommend the use of a concept judged appropriate for use in solving a classroom problem, the increase in student performance attributable to the protocol materials ranged from 200% to 341%. In addition, the use of the protocol materials consistently resulted in greater perceived utility of the concept for classroom teaching.

While pleased with these results, we remained troubled that we were not evaluating a student's ability to "read" and interpret behavior directly as it occurs in real life. Many irrelevant environmental cues are screened out in written descriptions, making the discrimination task easier. Similarly, reflection time is increased when a student can read a written example several times before responding to the item. Thus, we still did not know if we were helping students to recognize concepts as they occur in the real world. We reasoned that being able to identify concepts from situations described in written contexts might be a necessary, but insufficient condition for recognizing them in real life. We simply did not know.

In our third year of production, we decided that test films should be constructed to gather data related to these concerns. The funds that had been appropriated for our third year were insufficient for production of both instructional and test films, so we negotiated with the Office of Education to allow funds from our fourth year project to be used for this purpose.

Test films were produced to accompany the instructional films and materials we developed for teaching interpersonal communication concepts related to "feedback." Many, problems were encountered as we acquired our first experience in performing this task. Questions related to item difficulty and equivalent forms were extremely difficult. For example, a vignette judged to of moderate difficulty when prepared in script form might become one of extreme difficulty when recorded on film. When enacting a sequence, our amateur "actors" sometimes either increased or decreased the level of difficulty, by the very nature of their response (e.g., facial expression, tone of voice, etc.). Cues provided by actors that had not been considered troublesome when shooting instructional films were now seen as critical problems. The number of items on film had to remain small because of budgetary limitations. And where errors that most always "slip" through in written items can be easily corrected, weaknesses identified by students in filmed items could not easily be modified. Nevertheless, the experience gained from our first trial should be useful if we should engage in the production of test films again. I say "if" because in this fourth year (1973-74) we gathered empirical evidence relative to a number of crucial questions concerning the need for both instructional and test films. Our data are still being analyzed so firm conclusions cannot be reported, but if results indicate that written tests predict performance on filmed tests, then it might not be necessary in the future to prepare test films.

To better study the effects of our instructional films this past year, we developed two additional but parallel sets of instructional protocols. One set included slide-tape instructional materials and the other set contained written scripts for discussion and/or role play. These sets of instructional activities and materials were directed at helping students obtain the same concepts as our filmed protocols. Thus, our research and evaluation efforts examined three instructional treatments. In one case, students studied the concepts through the use of a conceptual overview, films and film guides. A second set studied the concepts through the use of the same conceptual overview, discussion and/or role plays of the scripts only (identical to the films), and written guides to accompany the scripts.

A pre-post evaluation design was used with all students taking written and filmed tests. At this point, it appears that we do not have significant differences in concept acquisition across any of our treatments. If this does indeed turn out to be the case after prolonged study of our data, it may raise serious questions about the efficacy of film and/or slide-tape protocol materials, for the kind of concepts we have been producing. In other words, if we find that our students can acquire concepts through discussion and/or role playing of written scripts alone, as readily as they can through the more elaborate and expensive films and slides, I would be one of the first to get out of the film business. While I have learned a great deal, the production of filmed sequences is extremely difficult and time-consuming. It may be the case that our students have been improving in concept acquisition because of the rigorous and systematic manner we use to define the concepts and produce examples of them. It may be that it is not the visualization per se that is crucial, but rather the extent to which examples (whether written or filmed) are powerful enough to generate meaningful mental images for students as they study the concepts. Further analysis of our data and replications of this type of research are, of course, needed before we can have confidence in these hypotheses.

One of the most difficult problems that arises in carrying out effective evaluation relates to training the users in such a way as to assure reliable and valid testing. A large portion of our materials were tested in individual study-carrel situations where instructor intervention could be minimized. But in all other cases, the understanding and attitude of the instructor toward concepts, the materials and the evaluation plan itself had to be dealt with. We naturally do all we can to encourage understanding and a positive effect of instructors before asking them to use the materials. We are frequently not as successful as we would like to be, of course. Some naturally disagree with the manner in which we have chosen to define the concepts while others question terminology and the appropriateness of various examples and illustrations. Some instructors are turned off by audio-visual materials, while others choose to slight the written materials. We monitored the extent our recommendations for use of materials are followed by having sessions with the users and by requesting them to maintain a log of their instructional activities. Continuous encouragement, explanation and assistance are typically required to maintain consistency in the experimental instructional treatments.

Our field testing activities have been limited to several other universities and we have not had the time or the manpower either to oversee their use of the materials or to obtain dependable objective data on student learning. We have tested our materials in three teacher training centers in the state of Michigan, with the general findings supporting our on-campus results. This suggests that the materials under consideration are of appreciable value and ready for dissemination and use at additional sites.

Dissemination steps are now being planned and we will respond to requests for materials produced in our first two years in the coming months. Our progress in this area has been delayed by the pressing demands of our conceptual work, materials preparation and evaluation tasks. Several protocol projects plan to disseminate their own materials, while a National Resource and Distribution Center has been organized to disseminate most of the others.

All in all, the protocol materials venture has been interesting, frustrating, growth-producing, mind-boggling, stimulating, tiring, and above all, challenging. We have come to recognize the complexity of issues and problems involved in the quest for more efficient and effective means of preparing teachers for the real world. My general impression at this time is that after all our trials and errors with complicated and sophisticated technology, we may well come to discover that the critical variable in successful concept teaching is the provision of precise definitions and relevant examples as conceived and expressed through almost any form of human communication.

Chapter III

Organization and Structure

By Donald E. Orlosky

The primary purpose of the Protocol Materials Program was to train personnel to develop protocol materials. The production and dissemination of effective materials and the knowledge acquired became the measure of the Program's success. Support activities for the Protocol Program included assistance in the development of materials, evaluation and field testing of materials, dissemination of materials, and training of other personnel in the development and utilization of materials. The purpose of this chapter is to describe the organization and structure that was established to coordinate these activities and meet the program goals.

Personnel Selection

Two groups of people were selected to meet the goals of the Program. One group consisted of Project Directors who developed the materials. The second group consisted of those who provided technical assistance and consultant service to the Project Directors. Both groups began their work at about the same time during the summer of 1970. Because of its multi-phases, the development of protocol materials required a continuous effort

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over several years to capitalize on the experience and knowledge gained at each step in the process. Most of the original participants remained with the Program in the following years, and this continuity contributed substantially to the progress of the training program.

The Project Directors were chosen from proposals submitted to the Bureau of Educational Personnel Development (BEPD) of the USOE.[1] Grants were awarded on the basis of the potential of the institution to provide the personnel and facilities required for the production of materials, the credentials of the Project Director, and the concepts listed in the proposal for the production of materials. After these criteria were applied, awards were granted to eleven institutions.[2] The first meeting of the Project Directors was called for July 1970 and all Project Directors attended this meeting.

The second group of people who worked with the Program became known as the Leadership Training Institute (LTI) on Protocol Materials. Based at the University of South Florida in Tampa with a Director, Associate Director, and staff, the LTI on Protocol Materials was created to give leadership and coordination to the Program. The panel members of the LTI, selected because of the various kinds of knowledge and skills they possessed, were recommended to the Program Officers of the BEPD by the LTI Directors and were then invited to serve. The LTI panel included seven members initially but was soon expanded to seventeen to provide the additional assistance needed.[3]

Program Management

Meetings of Project Directors were scheduled during the first year of the program by the LTI to enable Project Directors to report their progress and to identify and solve problems they faced. The LTI Directors also called separate meetings with the LTI panel. The separate meetings with the LTI panel were designed to inform the panel of progress in the Protocol Project, to seek the counsel of the panel and the USOE Director of the Program, and to assign responsibility to members of the LTI. Initially, plans called for three meetings with Project Directors during the year and three separate meetings with the LTI. There were also assigned site visits for members of the LTI to the projects for technical assistance. The separate meetings for the LTI and Project Directors planned to reduce the number in attendance at each meeting in order to confer with a relatively small working group. It did not initially seem advantageous for a large number of people to be assembled to deliberate in depth over the difficult issues posed by the Program. Another reason for the division was the varied role of the LTI. The LTI was assigned the coordination task of other BEPD programs including Training Materials, Performance-Based Teacher Education, Elementary Schools, and Teacher Centers. Thus, the LTI agenda and the Protocol Directors' responsibilities were not identical and separate meetings seemed advisable. For the early stages of the program this separate arrangement worked reasonably well but it soon became apparent that the groups were too isolated from one another. A change was arranged in which a one-day meeting with the LTI was followed by a two-day combined meeting at the same site with the LTI and Project Directors. These meetings were arranged three or four times a year. This procedure allowed more interaction between the LTI and the Project Directors. In addition, regional meetings were organized to allow each Project Director to meet with two or three other Project Directors and their staffs twice a year, with appropriate LTI members responsible for chairing the meetings and providing assistance to the projects. Projects were grouped according to geographic proximity or content similarity for regional meetings, and the LTI Director or Associate Director attended each of the meetings. With the new format of meetings, the LTI and Project Directors were brought closer together and the separate agenda of the LTI was accommodated. The small group format, which made possible in-depth focus on specific issues was retained through the regional meetings. These regional meetings proved especially helpful in giving Project Directors an opportunity to display their work to knowledgable critics and to obtain help on problems they faced.

Technical Assistance

The LTI was organized to supply technical assistance to individual projects, to solve program-wide problems, to coordinate the Protocol Project involvement of the LTI with the work of other BEPD programs, and to provide counsel to the BEPD in respect to the progress of the program. Technical assistance was made available to each project through consultant services. The willingness of Project Directors to accept suggestions from others and the collective knowledge that was available through the LTI, the Project Directors, and other consultants gave momentum to the progress of the Program. Every Project Director requested and received assistance, which illustrates the spirit of cooperation and desire to succeed that permeated the development of Protocol Materials.

Technical assistance included help at the large group meetings, separate consultant assistance at the project sites, and program-wide assistance with problems common to all projects. Fortunately the membership of the LTI included individuals whose previous work prepared them to give considerable help. The LTI panel included experts from the fields of educational research, educational psychology, interaction analysis, film production, micro-teaching, reading, English education, social science education, teacher education, and other related specialties. The Project Directors also represented a substantial resource from which the LTI Directors could draw for assistance across project lines. Each Project Director sought help on his own campus and in many cases was able to obtain helpful assistance. Projects sometimes needed consultants who were not directly connected with the Program. The LTI supported these requests and provided the additional assistance. As a consequence, the Project Directors had consultants available to them from a variety of sources.

After the program had been underway several years, Project Directors had learned considerably more about their work and the need for technical assistance for materials production diminished. The LTI then turned its attention to other facets of the Program more fully. Thus while technical assistance continued to be a major function of the LTI, it also assumed increased responsibility for other parts of its assignment.

Assistance at the large group meetings was provided by arranging for Project Directors to present their work, to receive feedback, to ask questions they themselves had about their activities, and to meet in small discussion groups. The agenda for the large group meetings was determined, in part, by recommendations from the Project Directors who identified areas of concern. A regular part of all meetings was the display of materials produced, critiques by Project Directors and LTI members, and review and analysis of Project Directors' accomplishments.

Consultant help at individual project sites was provided either by fulfilling requests from the Project Directors or by assigning a consultant to a project according to the judgment of the LTI Directors. Through this arrangement of individual consultants, the projects obtained assistance on conceptual, technical, or other issues which required more help than was available at their own institutions.

Perhaps the major assistance provided by the LTI was help with problems common to all of the projects. This assistance was provided either by establishing a committee of the LTI to concentrate on potential solutions to problems or by scheduling special meetings in which the problem area was the major concern. A few examples illustrate the organization and function of the LTI and its relationship with Project Directors in dealing with such issues.

One difficulty of immediate concern was the problem of concept analysis. It was soon discovered that existing literature on concepts was inadequate to meet the stringent demands in protocol development of naming and defining concepts and selecting behavioral characteristics that exemplify these concepts. A study group of the LTI was formed to work on this problem. It prepared recommendations that enabled the Project Directors to proceed with more clarity in their work.[4] An explanation of the committee's work was provided to Project Directors and a separate document was prepared focusing on concept analysis in protocol materials production.[5]

Another difficulty arose in respect to communication between Project Directors and film producers. Each used a specialized language, which made it difficult for the two groups to communicate clearly with one another. The LTI organized a conference in which recommendations on communication techniques and training sessions on using these recommendations was provided. A glossary of technical film terms was introduced and a format for handling communication problems was presented.[6] Project Directors were given instruction in the technical knowledge of film producers. The film producers were given more assistance in understanding the work of the Project Directors and their areas of educational concern.

Another example of program-wide concerns was the establishment of criteria for acceptability of Protocol Materials. A joint committee selected by the LTI and Project Directors was formed. This committee was charged with the task of bringing specific recommendations to the Project Directors about educational and technical criteria. The Project Directors reviewed the recommendations and with minor modifications accepted the criteria.[7]

These examples illustrate the relationship between the LTI and the Project Directors in solving program-wide problems. Numerous other tasks with program-wide implications were addressed in this manner. No single project had the personnel or financial resources to solve each problem on its own. The LTI assembled resources from its own panel, from among the Project Directors and from other sources to reach working solutions to the difficulties the program faced.

Service to other Federally-funded Training Programs

The LTI Directors met with LTI Directors from other BEPD programs to learn about their activities. Personnel from the USOE supplied the various LTI Directors with information to help coordinate the work of their programs with the larger goals of BEPD and with the aims of these other programs. LTI Directors of other programs whose work was most closely tied to the Protocols Program were invited to attend protocol meetings and reciprocal invitations of other LTIs were received and met. Close relationships with Teacher Corps were established and Protocol Materials were included on the agenda of national Teacher Corps meetings. When the BEPD regionalized its programs in 1973, the regional program officers responsible for Protocol Materials also had responsibility for the Career Opportunities Program and Urban-Rural Programs for School Development, which provided a natural link between Protocol Materials and these programs. Presentations were made at regular meetings of the USOE and, in turn, various USOE personnel also attended meetings of the Protocol Project Directors. The LTI maintained liaison with the AACTE commission of PBTE since its inception and also served as coordinator of federally-funded Teacher Center projects. The other responsibilities of the LTI included, at various times, coordination responsibility with teacher training materials, The Elementary Models Program, training complexes, and teacher centers. All of these contacts created a network through which dissemination and information about materials was communicated.

Dissemination

Dissemination includes three levels of activities. One is the informational level in which others learn about the existence of Protocol Materials. This level calls for exposure of protocols to various audiences. Such exposure, among other things, provides an opportunity for raising questions and making suggestions about the potential use of these materials in the training of teachers. A second level is the dissemination of training in how to use and produce Protocol Materials. The third level of dissemination is the actual distribution of materials. Each of these levels of dissemination have been undertaken and coordinated by the LTI.

The informational level about Protocol Materials is provided in two different procedures. One procedure is to write about the program and publish information through professional journals. Another procedure is to present the Protocol Program on the agenda of meetings of professional associations and for other teacher training groups. Both activities have repeatedly taken place. Protocol Materials first received national recognition before the program began in Teachers for the Real World. Since that time additional articles have appeared and the LTI has sponsored articles that have been circulated widely. Professional associations have included Protocol Materials presentations on their national and regional meetings since 1971. Presentations have been made at numerous other meetings.[11]

The dissemination of training has been provided through several activities. During the 1973-1974 academic year nine trainees were selected in the fields of mathematics, social studies, and English to learn how to produce Protocol Materials. These trainees participated in all activities of the Protocol Materials Program during their training period and also worked closely with at least one project. The trainees also prepared documents identifying concepts in their respective fields of study which provides a basis for content selection of future Protocol Materials. Considerable training has also taken place at individual projects. Many projects have utilized other faculty and graduate students in their work. This combination of LTI trainees and project workers has resulted in 150 or more people being trained in how to develop Protocol Materials. This is a relatively small number of people but if funds for support were available, and each person who was qualified to direct a project was given a two year period in which to develop 10 protocol products, the benefit to the educational community would be 1500 protocols on a wide-range of topics on teacher education. The number of people trained at the present time exceeds the funds available to produce high quality materials.

Some initial training of personnel has also been provided through presentations of Protocol Materials at professional meetings. These presentations have required audience participation in the development and utilization of mateials. Some of the same training that would be offered to prepare Project Directors has been included. The experience gained by the Project Directors and the documents produced by the LTI provide resources for those who have the time and fiscal support to produce Protocol Materials. The lessons learned in the Protocol Materials Program now enables new developers to be prepared in a relatively short period of time to produce satisfactory materials.

The third level of dissemination is the distribution of the materials that have been developed. After the first year of the Program, efforts were made to provide for dissemination of materials. An LTI committee was formed to investigate dissemination issues and they organized several activities to meet this goal. A publishers' conference was held to discuss the interest of commercial houses in distributing Protocol Materials. Publishers were invited to meetings of Project Directors. Letters were written to publishers inviting them to consider the publication of Protocol Materials. Interviews were held with individual publishers. The USOE copyright attorney supplied assistance and attended the publishers' conference and other meetings of Project Directors. Some Project Directors publicized their work through the Publisher's Alert System. The LTI established a National Resource and Dissemination Center (NRDC) to make this outlet available to Project Directors who chose to disseminate their materials through this agency.

As a result of these arrangements, most Protocol Directors now have procedures for the dissemination of their materials. In some cases arrangements have been made for materials to be distributed through a commercial publisher. In other cases, projects are handling their own distribution through facilities at their respective institutions. In other instances, the projects have joined the NRDC and are distributing their materials through this outlet. The LTI plans to continue publicizing and supporting distribution by listing all projects in LTI literature and arranging for Protocol Material presentations through professional organizations. Plans are underway for the LTI to devote most of its future resources to the dissemination of Protocol Materials. These activities include mass-mailings, contact with organizations that heretofore have not included Protocol presentations in their annual meetings, and collaborative efforts with other professional organizations seeking materials to improve the training of teachers.

Chapter IV

Conceptual Issues

By Bryce Hudgins

The story of the protocols program is one of a series of issues, each of which occupied center stage for a time, only to be crowded into the wings by other, even more pressing problems. But each, after a time in the shadows, reasserted itself like the cry of a spoiled child who will not be denied. This is as true for at least some issues about concepts as for any other dimension of the program. This chapter is an opportunity to do some intellectual "mopping up" of persistent conceptual issues, and to impose some order upon the questions and problems that developers confronted in the heat of struggle. That order took a long time to emerge, and it is more apparent at the present time than it was earlier. It would be a disservice to the reader not to convey the disordered sequence through which progress was sometimes made. Early meetings of the program's directors with staffs of the initial protocol projects were long, difficult, and sometimes produced intense anxiety. Among the reasons were the persistent conceptual problems, which took various forms. Fundamental questions about the definition and the functions of protocol materials were asked repeatedly. Pet conceptions held by one or another project staff failed to withstand the intensive

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questioning that occurred in group sessions. But when the earlier ideas were abandoned, there was often not a new and adequate conception available to replace them. Somewhat later, when the first trial protocols were shown, the concept that had seemed so clear and definable in planning sessions captiously defied efforts to reduce it to film. Such happenings, of course, further intensified the need for careful consideration of the conceptual nature of protocols.

The protocol program was confronted with three major conceptual issues.

1. What is a protocol? Ought it to be a "slice of life" from which conceptual analyses are made, or should a protocol be an effort to teach a concept, and therefore constructed and polished to portray an idea in as much detail and clarity as possible? This first issue did not emerge clearly until well into the first year of the protocol program. As we shall see, the initial conception of protocols was much closer to the slice of life analogy, and only over time did the difficulties inherent in that position become apparent.

2. What bases ought to be established to identify concepts for the program? This question had to be approached from at least two positions, which are in some ways antagonistic to each other. One position says that the personnel of each project should identify and develop concepts for their project. This would be done in accord with some overarching conception of how teacher education ought to proceed, and there would emerge over a period of years sets of concepts that possess a degree of internal consistency. Furthermore, since concepts important to teacher education have not been carefully identified and defined, and since different people can argue for concepts from different

conceptual or theoretical frameworks, or from different dimensions of classroom or school life, autonomy in this respect ought to remain with Project Directors. A different position holds that the pedagogical domain is subject to conceptual analysis, and that from such analysis there can emerge, if not conceptual systems, at least collocations of concepts. In this way, the protocol program can both more easily and more effectively insure that its funds are being devoted to the development of materials that are likely to be of some widespread interest within the profession of teacher education. The discussion in this chapter draws heavily upon the second position, but it is not intended to disparage the first. Concepts have been selected principally by project staff, and it remains to be seen whether a centralized catalog of concepts can furnish choices of concepts that are acceptable and viable. The issue is open at this time.

3. How should concepts be portrayed? With the recognition that protocol materials were to help teach concepts, a host of questions appeared. Some of those questions concerned complexity of portrayals. How many examples of the concept in question have to be displayed? Through what values or range of differences must this occur? The other side of the complexity issue was the problem of learning. One might teach a concept in various ways depending upon the learning objectives that the developer hopes to achieve. We will not attempt in this chapter to specify such learning objectives, but it should be understood in later discussion of the portrayal of concepts that those objectives govern such factors as the number of instances, the amount of background interference, and the complexity of the examples the learner is expected to identify.

What is Protocol?

The original conception of Protocol Materials for teacher education was presented in Teachers for the Real World.[1] In that formulation Protocols (or behavorial situations) were to be segments of ongoing school instruction permanently recorded on film, audiotape, or some similar medium. The various elements of those segments would be analyzed and classified and the Protocols could be stored for later use. As the concept of Protocol Materials was then envisioned, such materials would bestow a major benefit upon teacher education programs and one that even live observation of classes did not provide. People would not have to rely so heavily upon their fallible memories, since such records of classroom events would make repeated viewings and analyses possible.

Within two years of the publication of that initial statement, the prevailing idea as to the fundamental nature of a Protocol had shifted substantially. It was seen as a record which had the principal objective of teaching a single concept. Several events had transpired in the meantime that led to this altered definition of the idea.* While listing those causes in the order of their importance would be impossible, each of those described here probably contributed in some measure to the gradual alteration of the term. When Protocols were made by filming or videotaping ongoing classroom situations, with an eye to identifying and classifying their contents, a number of difficulties emerged. In some cases, classroom behavior has little identifiable conceptual content, and great amounts of filming might produce little that the developer would find significant. The real situation, further-

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*The idea as it is developed here is not universally accepted. Cruikshank has written that Protocol Materials should begin by representing classroom events as they are encountered by teachers and pupils, and that the concepual basis for the study of teaching is to be found within those real situations.

more, does not necessarily highlight those elements which the developer seeks. Situations tend to be filled with psychological noise; that is, other events compete for attention with those which it is hoped the Protocol will teach. Such noise not only diffuses the attention of the viewer, but also make it more difficult for the learner to discriminate the elements to which he ought to attend from those which are of little use to him. In a similar vein, the probability that viewers will respond to the wrong aspects of the events they watch was greater than in more carefully prescribed situations. Viewers tend to impose their own value systems upon what teachers in Protocol segments are doing. They are prone to judge the teacher's behavior as "good" or "bad" without improving their own understanding of linkages between events, and so forth.

The shift we are speaking about affected all aspects of the program. Whereas in the beginning, most people had assumed that filming of virtually unstaged, natural classroom situations was the appropriate way to produce Protocol Materials. The kinds of problems identified above cast grave doubts as to the efficacy of that procedure. Subsequently, project staffs explained more fully for the teachers in their filmed sequences what must transpire in the classroom to illustrate the concept under study. Although at the present time, a range of techniques are in use by different Project Directors, the central tendency is for greater control by the projector director. At least some groups who produce Protocol Materials now use professional actors as teachers. Thus, to increase control over the events that occur on Protocol films has had the inevitable consequence of reducing the amount of filming under natural and uncontrived circumstances. Reactions of student teachers and others who have studied later Protocol films have not been adverse to enactments or rehearsed segments. That, in the last analysis, is a critical test.

Bases for the Selection of Concepts for Protocol Materials

A major approach to the issue of selecting concepts for Protocols was the development of a catalog of such concepts. The assumption was made that a catalog would provide a central and systematic classification of concepts in the pedagogical domain of teacher education. The catalog would provide a basis for the selection of concepts for Protocol production. There are several reasons why a catalog might have some merit for that purpose. For one thing, it would offer a beginning at conceptual mapping of the pedagogical domain; it would throw into relief both redundancy and gaps within the domain as it currently exists. For another thing, concepts in this catalog could be stated in ways to give basic and useful information to the developer. The statement of a concept would not be limited to mere labeling, but would include precise definition of terms, as well as statement of indicators and examples of the concept as it might appear on film or in another medium.

Those who initiated the national program of Protocol Materials had assumed from the beginning that some central effort at providing conceptual guidance would be both advisory and necessary. No doubt it could be argued that conceptual efforts to delineate and clarify the pedagogical domain, some part of which might be accomplished by a catalog, ought to have preceded the production of materials. The realities of planning and of program development, however, both demanded that conceptual issues and issues of production emerge and be dealt with simultaneously.

By the end of 1972 the Leadership Training Institute had commissioned the development of a document on concepts which has been completed.[2] The initial charge to the author of the catalog and his colleagues was to identify concepts of central importance to the pedagogical domain. Preliminary analysis of the "pedagogical domain" led to the conclusion that far too much territory would have to be covered for an initial enterprise. The scope of the catalog was accordingly restricted to concepts about interactive teaching. The same analysis suggested that other subdomains exist within the broader pedagogical domain. These were identified as "collegial relationships," "teachers and administrators," and "the teaching profession and the broader community." These areas are seen as concentric circles moving outward from the central occupation of interactive teaching. Nonetheless, each of them represents a portion of the pedagogical domain requiring conceptual analysis and ordering not unlike that which has been accorded to the subdomain of "interactive teaching."

Interactive teaching is conceived of as including all transactions between teacher and one or more pupils as they go about the business of teaching and learning. Interactive teaching occurs in a social system which is composed of four mutually dependent elements: (1) the teacher; (2) the content to be learned; (3) the pupils viewed as members of groups; and (4) the pupils viewed as individuals functioning in a social context. Although the four elements are dependent upon one another, the teacher's role is the dominant one in interactive teaching, and the catalog reflects this differential weighting by presenting a large proportion of concepts that reflect what teachers do and how they influence the outcomes of pupils. The basic conceptual structure of the catalog is depicted below in Figure 1.

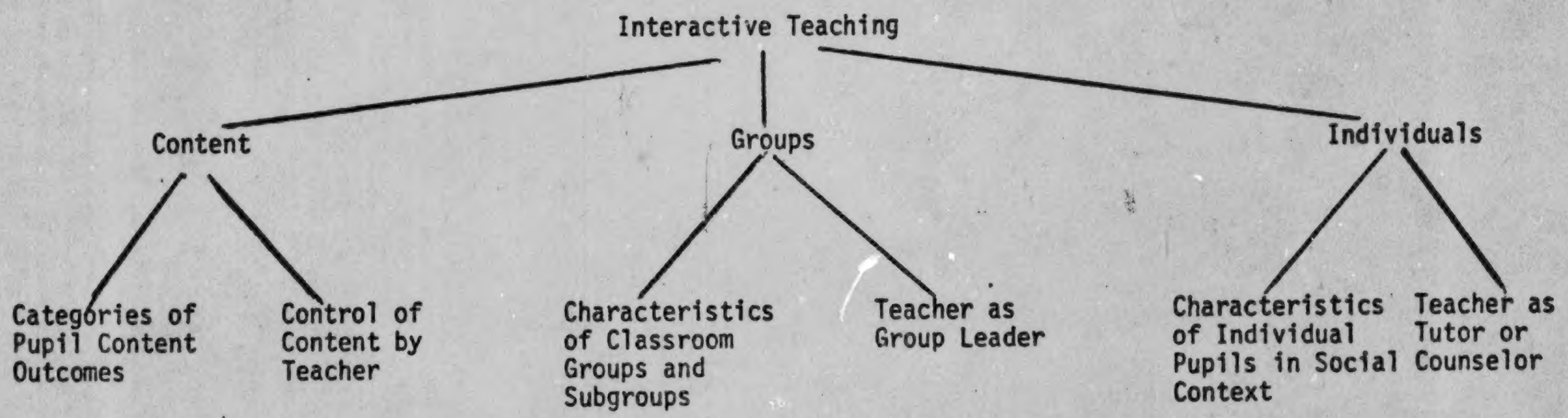
Interactive Teaching
Content
Groups
Individuals
Categories of Pupil Content Outcomes
Control of Content by Teacher
Characteristics of Classroom Groups and Subgroups
Teacher as Group Leader
Characteristics of Individual Pupils in Social Context
Teacher as Tutor or Counselor

Figure 1: Catalogue Format: Derivations of Categories from the Concept of Interactive Teaching

The catalog is organized according to the categorical subdivisions indicated by the lower branch of Figure 1, although most of them are further differentiated within categories. The catalog is not a taxonomy, though an effort has been made to group concepts within the broader categories. For example, concepts pertaining to how teachers control content in interactive teaching are subdivided into three sections. One subsumes concepts that refer to braod approaches or styles of controlling content. Another includes concepts that pertain to control through regulation of the flow of content, either by means of the rate, the amount, or the intellectual level. The third identifies concepts which involve evaluation, either of ideas in the content, or ideas expressed by participants. Concepts pertaining to pupil groups are organized, with the exception of some introductory and explanatory concepts, according to whether they deal with group morale, group productivity, or group control. A similar procedure has been used to categorize concepts about pupil content outcomes.

How is the catalog designed to contribute to the program of Protocol Materials? The format of concepts in the catalog provides the types of information which are necessary to the initial stages of Protocol development, such as specifying indicators that must be present if any given episode is to represent the concept faithfully, and presenting illustrations that might be enlarged into Protocols. A second service the catalog can perform for those developing Protocols resides in the usability of the catalog as a reference guide--even while it is clear that the catalog cannot be used as a single instrument to identify concepts worthy of production as Protocols in the pedagogical domain. For one thing, that domain is broader than the subdomain of interactive teaching to which the catalog is limited.

Beyond that conern, it was also established that the boundaries and substance of the domain are amorphous and imprecise. They may through the years become clearer and more definite. In the meantime it would be poor policy to declare the catalog as the repository of all legitimate concepts upon which developers might draw. But even here, it can serve as a foil and as a source of comparison and suggestions for developers as they undertake Protocol production.

In addition, the catalog has broad utility for teacher education in general apart from its usefulness to Protocol producers for the creation of the catalog. One of them entailed examining the conceptual domain of teacher education without regard to the ease of producing Protocols, and independently of commitment to any particular set of subset of concepts. In short, the goal for the catalog authors was to lay out the domain as fully as possible, freed from the burden of using the products of their search to develop Protocol Materials. The authors of the catalog are optimistic that its usefulness will apply more braodly within the field of teacher education. Thousands of individuals at colleges and universities throughout the country are responsible for the education of new teachers and teachers already in service. Although they are not formally involved in the tasks of professional materials production, the catalog may serve some of their purposes by offering a conceptual framework for such programs, or in suggesting definitions and illustrations to assist in making programs more concrete and meaningful.

How Should Concepts be Portrayed Through Protocol Materials?

If we think of a Protocol as an effort to teach a concept, two major kinds of issues arise. In a publication prepared for the LTI and Project

Directors[3], these were identified as analytic issues and didactic issues (Hudgins, 1972).* knowledge of these issues, and the raising of appropriate questions about them, provides the developer with an approach to the general question of how concepts should be portrayed in Protocols.

Analytic issues are those that concern the unfolding of the concept. When one is engaged in an analysis of a concept, he has before him continually the question of the concept's composition and elements. What are its dimensions, and what are the values of each of them? What connotative meanings does the concept carry, and how precise are they? Analysis of a concept is not concerned with how to teach it. Rather analysis involves laying out the concept in its entirety. It is in this phase that the Protocol developer can see all the dimensions and all the values of those dimensions that comprise the concept. He may wish to write numerous examples or instances, both positive and negative, that will enable him to produce an effective Protocol. Questions about how one dimension should be emphasized over another, or which values of a concept require delineation in a Protocol, can be answered more adequately in the didactic stage of conceptual work if this analytic stage is thoroughly accomplished before didactic issues become the center of attention. A crucial test of whether a concept should be developed into a Protocol lies in the adequacy with which this analytic stage can be performed. Concepts that have been the object of empirical investigation are especially good candidates for analysis because research about them has necessitated careful examination of their properties. Research also furnishes the developer with evidence about empirical relationships between this concept and others about interactive teaching, and/or how it is related to pupils' learning.

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*A third issue identified in that paper, learning outcomes, will not be dealt with in this chapter.

Didactic issues require the developer to focus his attention upon the questions of what kinds of examples or instances of the concept are necessary to teach it to someone. What are the respective roles of positive and negative examples? How many episodes are required, and how ought they to be sequenced? These questions draw upon the artistry of the developer. Precise answers cannot come from recipes and formulas about how to put together a Protocol. However, two principles and some procedures can be provided as guides to the developer's efforts.

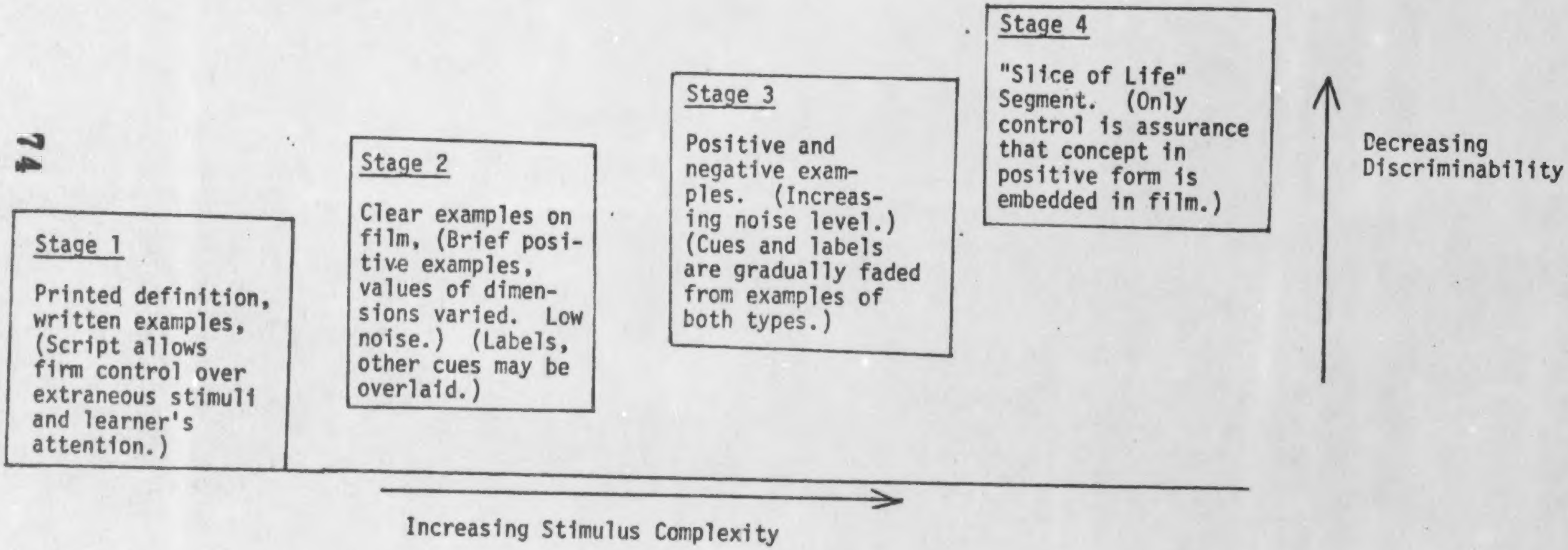
1. The teaching of a concept should begin with clear, simple examples of its positive form, and move progressively through a series of stages that incorporate increasing stimulus complexity and demand finer discriminations on the part of the learner.
2. A new, but related concept should be introduced only after the first concept has become clear, stable, and unambiguous. Points of tangency between the two concepts should be stressed in an effort to keep them discriminably different from each other.

Those principles can be reformulated in more concrete terms that begin to suggest a program of action for the developer.

1. Begin with one of the concepts to be taught. Define and describe it: give the learner as many conceptual hooks as possible.
   a. Construct simple, clear positive examples of the concept.
   b. Use prompts or cues as necessary to simplify the concept.
   c. Label the concept.
   d. Sample all relevant dimensions and values.
   e. Provide for learner response to each example, and for feedback to him about the correctness of his responses.

2. Shift to other examples of the same concept.
    a. Remain with positive examples of the concept.
    b. In this stage, gradually eliminate the prompts and cues.
    c. With progressive examples, increase the stimulus complexity; include more irrelevant cues.
    d. Continue to give the learner a chance to reveal the extent of his learning.
3. Select a second, related concept for presentation. Relative to the first concept, this should be the most similar of those remaining to be presented.
    a. Again, make use of labeling, cues, prompts, and other devices to simplify the stimuli that the learner must respond to.
    b. Use these, and the text of your examples, to emphasize and clarify the basic similarities and differences between the new concept and the old.

Both the principles above and the concrete steps which follow can be shown in four stages through the use of a specific concept as an example. Figure 2 is a schema of the four stages of development that follow.



Stage 1

Printed definition, written examples, (Script allows firm control over extraneous stimuli and learner's attention.)

Stage 2

Clear examples on film, (Brief positive examples, values of dimensions varied. Low noise.) (Labels, other cues may be overlaid.)

Stage 3

Positive and negative examples. (Increasing noise level.) (Cues and labels are gradually faded from examples of both types.)

Stage 4

"Slice of Life" Segment. (Only control is assurance that concept in positive form is embedded in film.)

Decreasing Discriminability
Increasing Stimulus Complexity

Figure 2: A Schema for Presenting Concepts in Media

In the following example the concept is of "positive rating". "Positive rating" is an accepting reaction by the teacher which occurs when a response by a pupil is followed by a rating from the teacher that is positive, admits the response, paraphrases or repeats the response, or results in a qualification by the teacher.

Stage 1

When the teacher gives a positive rating, which may be either verbal or non-verbal, no doubt is left that she unequivocally accepts the response of the pupil. An example of such a cycle is given here:

First grader: (reading haltingly) Ted--throws--the--ball.

Teacher: Good girl, Cathy!

As we have indicated, some or all of the exchange could be non-verbal. For example, with a minor alteration, we would have the following, still an example of positive rating.

First grader: (reading haltingly) Ted--throws--the--ball.

Teacher: (Smiles, nods).

Stage 2

In this stage, media is used to portray the examples. All examples are positive, and they should be relatively clear and simple. Part of the appropriate strategy is gradually to increase complexity and reduce discriminability during this stage. This can be done by (a) gradually reducing labels, cues, and prompts, and (b) introducing examples that are not restricted simply to the essentials of the concept being taught.

The following example, if appearing on film, would be a good introduction to Stage 2.

P:: Andrew Johnson was impeached, he just wasn't convicted.
That is, the Senate decided he wasn't guilty.

T: Right on the head! That's a very good answer.

From a Semantic standpoint, this example is no different from the one given for Stage 1, but there is a sense in which it is more complex. It occurs within the normal context of an ongoing classroom. The developer would be very careful in introducing this stage to label and cue the episode appropriately. He must, however, be equally careful in seeing to it that, by the close of this stage, the learner is independent in his ability to identify and state criteria for episodes of this or somewhat greater stimulus complexity. Obviously this means the developer must be at pains to insure that learners are responding to appropriate elements of the substance of episodes and not just to the cues or labels supplied in the early teaching episodes.

Stage 3

The transition to Stage 3 is signalled by the complete absence of overlaid cues for positive examples, and by the introduction of negative examples, as well as by less concern about controlling the noise level, or irrelevant stimuli, that appear on film. For instance, embedded within the action of Stage 3, we might have episodes similar to the two that follow.

P: Jerry said the Republicans
won the election of 1912,
but Wilson was a Democrat.

T: Yes, he was.

P: Another cause of unemployment is that--well, if a man
doesn't have a job--you know--he can't buy anything,
and then that hurts business.

T: Oh? Well, I see your point. OK.

The first example is unmistakably one of a positive rating because the teacher accepts the pupil's response unequivocally as correct. It lacks the enthusiastic modifiers (and presumably the intonation that signifies enthusiasm as well) which have accompanied the earlier examples. The second example is not a positive rating and hence is a negative example. It does, however, portray the concept of "admitting", in which the teacher's reaction, not positive, is mildly accepting or equivocally positive. When the negative examples call for initial subtle distinctions, cues may be provided, but they would be discontinued before the close of this stage. Stage 3 would not be complete until the learner can discriminate acceptable but less than totally clear examples of the concept to be learned from examples of other kinds of behavior that are similar to but differ from the standard behavior in one or more dimensions.

At Stage 4, the learner should be capable of identifying any acceptable example of the concept as it appears in ongoing classroom behavior, even though it may be surrounded by negative examples and a high noise level, and using the concept to explain ongoing events. The developer's aim at this stage is to provide the student with as natural a slice of classroom life as he can capture. The only constraint under which he operates is that examples of the concept to be learned appear within the context of the film.

Two additional observations are in order. One of them is to note that Protocols do not always need to proceed through Stage 4 of the previous analysis. They may on occasion be developed no further than Stage 1 or 2. This would occur when the concept is simple and straightforward, or when the developer wishes to arouse the learner's awareness of a concept but is not concerned that it can be identified or interpreted in the most complex settings. The determinant of the appropriate stage is the kind of learning outcome the developer selects, Stage 4 would be selected only for the most complex concepts that require the learner to discriminate the desired behavior under conditions of maximum verisimilitude to an ongoing classroom.

Finally it should be noted that we have been speaking of the identification, analysis and comprehension of concepts about teaching embedded in behavior of predetermined complexity. Students who study Protocols developed as we have outlined them cannot be judged *a priori* to have the capacity to *perform* the behavior represented by the concept. Whether such skill is a natural byproduct of conceptual analysis and understanding is a question that can and ought to be studied. We would only affirm that the purpose of Protocol Materials is to serve the conceptual foundations of the study of teaching and to enhance the teacher's understanding of the complexity and the essential intellectual basis of his work.

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Chapter V

The Technology of Protocol Materials

By Richard Lid

At the first directors' meeting, it was explained that protocol materials are multi-media materials. They could be developed using audiotape, videotape, film, filmstrip, and print. Most of the directors thought in terms of developing protocols around an aural or visual medium with print as an adjunct -- in the form of written guides, pre- and post-tests, and supportive and explanatory exercises. It was made clear that there was nothing inherent in the nature of protocol materials which said that print is a necessary second medium in any protocol "product"; still, producers have by and large resorted to print for fuller explanations and for testing for acquisition of the "concept" the product has been designed to demonstrate.

While there was nothing in the original grant announcement of the protocol materials program to suggest the superiority of one medium over another for the development of protocols, there was an obvious preference by directors for a visual medium. In itself this was not surprising, for most of the proposed protocols dealt with behaviors, whether in a classroom or in a setting outside of class. Visual documentation seemed in

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order. What is surprising in retrospect is the number of developers committed initially to videorecording over film. Since two years later not a single project was still using video tape to record behaviors, some explanation is in order.

At the roots of the preference for television undoubtedly lay the seeming accessibility of the medium to the developer and the relatively small cost involved in production. Many developers had experience with micro-teaching, including operating the video camera of a portable unit. The newer and less glamorous medium, videorecording was thus less foreign to the developers than film. It had a "do it yourself" quality about it, one that appeared to break down the barriers between the developer and technology. In the early phase of the protocol program the question of technical standards had not been broached by the Project Directors inexperienced in film making or systematically by the LTI. There were notable exceptions to the inexperience at some of the project sites. The Project Directors at a few sites had the advantage of previous work in film production that enabled them to avoid the problems feared by the majority of the Project Directors. There was even a feeling among some Project Directors that protocols that did not have a finished or professional quality would be acceptable -- a feeling that no doubt was reinforced by the acknowledged theoretical emphasis at the time on the notion of a protocol as "an original record of a transaction," a slice of life, the raw data of experience. For these reasons there was an attractiveness about videorecording as the appropriate visual medium. Where the developers who consciously or unconsciously held such views went astray was in their lack of knowledge of the technology involved; for inexpensive portable videorecorders were unsuitable for the duplication which would be necessary for material which was to be used over and over again at various colleges, universities, and public schools around the country. In other words, developers had this early to face the dissemination issue, including the problem of the compatibility of video equipment. In addition, not only was the recording equipment needed of a sophisticated kind, but the video editing equipment needed to put together interesting slices of life, vignettes of experience, was even more sophisticated.

As the emphasis shifted in the national directors' meeting in the first year from overall considerations of the theoretical framework for protocols to issues of what a protocol should look like (issues of shape, content, and length, as well as of medium) and of what a protocol was about (the defining of concepts, the demonstration of their utility), a shift toward film developed which was to prove irreversible. Directors inexperienced in recording behavior soon discovered what the experienced film makers knew about the limitations of the technology of videorecording in terms of equipment, costs, and personnel. Somewhat later they were to discover the limitations of kinescopes and kinescope processing.

Most protocol developers in the USOE program had a high interest in the development of visual materials, though some were more interested in effectiveness and results than in the visual material itself. Visualization in these instances was seen as far less important than the overall protocol "package." Very few directors had direct knowledge about the technology necessary to work in media other than print.

Indiana University, the Far West Laboaratory, and Education Development Center had experience making materails similar to protocol materials--but even here there was diversity of knowledge about the approach to technology. EDC and Indiana University were the only development sites which had film makers on its staff and could also be said to have an articulated theory about film in education. Indiana University also utilized an established independent educational film maker whom it had worked with successfully in developing a film for the "Critical Moments in Teaching" series for Holt, Rinehart & Winston. The Far West Laboratory had the experience of developing films for its well-known "mini-courses" but was initially to choose videotape over film. Far West had experienced technicians on its staff in both film and video recording and also sophisticated editing equipment in both media. In this, it was exceptional.

Other developers were in various states of sophistication about visual and aural technology and had various lines of access to technical assistance. Developers at Michigan State University and Ohio State University had large university-run film and video organizations to rely on, and chose to do so. The developer at the University of Southern California employed several small independents. California State University, Northridge, first worked with a faculty member whose field was film; later, after calling in a consultant, it turned to a small independent film maker. Both southern California developers had access to the talents and the laboratories available in Los Angeles, yet each had an initial bad experience in finding the right people to work with and in establishing a good working relationship with those providing technical assistance. Some developers were not to fare as well in finding locally adequate technical assistance. Bucknell, Washington University at St. Louis, Teaching Research (Oregon), Southern Illinois, and Colorado were all to experience serious difficulties in the first year.

All of this suggests the essential naivete about technology of most of the educators turned developers in the opening phase of the program. They made various assumptions which were not borne out by the experience they were to have. They counted on being able to find and employ adequately trained local people who could execute their ideas in the technology of the medium they employed. They did not expect to have to learn about videorecording or film making, editing, and processing--beyond being able generally to express their needs. They were trusting of the expertise and wisdom of those they employed. The slowness of making films, the successive stages of production, the fits and starts, the technical bloopers that occur at all levels--these were foreign to them. Above all, they were unaware of the need to establish a clearly delineated and close working relationship with their technical people; they lacked the experience to know that this relationship had to be grounded in knowledge of technology, as well as of the costs involved.

The relationship which a developer establishes with those controlling the technology is the crucial factor in the successful production of visual materials. If the developer takes solely upon himself the conceptual development of the idea of the film, including the visualization, he is apt to make an unimaginative and unconvincing film. (As one developer put it, he found himself remaking the awful films he had watched in eighth grade 25 years earlier.) On the other hand, if the developer abrogates to the film maker his own responsibilities of conceptualization and visualization, he may end with a splendidly imaginative film which reflects little of the concept he is trying to portray and whose educational value is nil. He may also find himself with a visual document which falsifies life (the life of the school, the life of the child) as he knows it. The product of the one tends to resemble printed matter simply transferred to film; the other becomes a runaway production of elaborate effects and unnecessary sequences. Neither, of course, is satisfactory.

There is no single ideal working relationship with those providing technical assistance, but certain conditions can be stated for a successful relationship: the developer must understand the technology of the medium, including costs, to the extent that he knows the range of possibilities open to him. He does not need to know how, say, to operate a camera or to edit film, but he does have to know what a cameraman can and cannot do under certain conditions, as he has to know what kind of editing is possible given the visual material available. The film maker, on the other hand, must know what the developer wants. He does not have be be a specialist in the academic field of the developer, but he does have to understand the concept to be filmed and its essential attributes as opposed to its trivial aspects. The film maker can easily lead he developer astray under the guise of creativity. The developer can stifle the film maker by his academic rigidity and unwillingness to be experimental--to be visual in the best sense of the word.

In the initial phase of the protocol materials program most developers found their time schedules and their often ambitious plans disrupted as they turned to learning about technology and to creating meaningful personal relationships with film makers and others involved in the technology of their products. Meanwhile, the LTI Directors and selected LTI panelists tried to help the developers by centering attention on such issues at national and regional directors' meetings and by providing media consultants at these meetings. Still the problem had to be resolved at the local level. Consultant help could only be diagnostic--and supportive, as it was.

Variety in Protocol Materials

Any group of developers making visual products under a common rubric such as "protocol materials" might be expected to share common problems. They might also be expected to produce materials that by and large look alike --in terms of conception, form and style, and in accompanying printed matter. Such has not been the case in the protocol materials program.

One basic reason for the differences of product among the various protocol projects has been the varying nature of the "concepts" to be portrayed. They have been of different orders as well as of different kinds. "Probing," "aggressive behavior," and "authorial voice," for example, are vastly different concepts. Beyond this, different visual approaches were found necessary depending on whether the developer was in the pedagogical domain or the basic fields of knowledge. In general, the distinction has meant the difference between classroom and non-classroom filming. But even within the pedagogical domain the distinction plays a role, depending on whether attention is centered on teacher-pupil interaction or solely on pupil behavior. Films which call for classroom shooting makes one set of demands on the developer. Films which show pupils in other situations, even within a school context, make a different set of demands. Films which must show class-size group of pupils have a different form from those which need only show small groups or indivisuals. All of thses conceptual requirements affect the technology involved.

A second set of requirements which affect the nature of the protocol product comes about because of the developer's role as an educator. He is not simply making a film which must possess "educational value" in the broad sense of the term. He has a circumscribed and direct goal before him--meaningful and significant mastery by a select clientele of the concept he is presenting. In most instances this has meant that the developer has a "design" in mind before he proceeds to filming. Both guide-making and field testing are generally part of the working out of the "design" and the developer frequently finds the three activities affecting one another in terms of technology. The effect may be more dramatic for filming but it is just as serious for the other two. What the developer needs to film may partly be determined by the guide and by field test requirements--but of necessity what he is successfully able to capture on film partly controls the writing of the guids and the design of the field test. Whatever variable plays the larger role in any instance, the overriding goal of the developer--the adequate portrayal of the concept and its acquisition and ultimate use by a clientele--shapes all of his activities. Underneath, at some less conscious level, no doubt the developer's personality, educational philosophy, and interior vision of what he is really about all play their role in the product finally presented to the consumer.

Theories about what a protocol "package"should look like vary as much as theories of what a protocol film should be. The "package," which includes printed matter, may be expansive and complete or skeletal and suggestive, open-ended. Similarly, a protocol film may be barebones, long enough merely to instance the essential attributes of the concept, or developmental in the sense of providing reinforcement and elaboration on the nature of the attributes. The intended audience may be quite clearly pre-service teachers or it may also include in-service personnel. The "design" usually reveals which is the case, though the film, by the way it addresses the concept in question , also tends to reveal the designated audience, sometimes unconsciously. Beyond this, it should be said that guides can be seen as adjunctive and supplemental or as integral and essential in the learning process. Most but not all guides in the protocol program provide explanation and background, including relevant research, as well as exercises, activities, tests, bibliographies. Some developers have deliberately, and after experimentation, designed minimal guides. Some have made one guide to cover the entire series of protocols developed. An additional qualification all of the above is that some "packages" have been designed for individual, self-paced instruction, while others are intended for in-class use. Some make minimal demands on an instructor; others pre-suppose a person trained in the particular concepts. Because some products make demands of the trainer-user in terms of knowledge and understanding, ome developers have provided a separate instructor's manual.

No inventory of differences such as above can either fully describe the variety evident in the products of the developers of protocols or account for the differences among products. Even while it suggests in these instances the close interplay between what is to be learned (concepts), the means by which it is to be learned (technology), and learning theory, it fails to take into account the more specific ideas held by the developers about the technology employed. Again, there was variety, and developers were sometimes at odds with each other over issues of technology. Two significant and related early issues illustrate the point.

Very early in the history of the protocol project there arose the issue of versimilitude in the instancing of behaviors to illustrate a concept. Initially some developers saw a need for absolute authenticity--in the sense that spontaneous and unrehearsed behaviors were the only valid behaviors. This was reinforced for some by the underlying assumption that the developer should film behaviors, then derive concepts from the behaviors. In any case, the sense that protocols were exact replications of life led to a rejection by some of enactments of rehearsed conduct or simulations, no matter how convincingly portrayed. It also led to the issue of the documentary nature of protocol products, including the question of whether to film in black-and-white or color. And ultimately it led into issues of form: should there be voice-over? Should other visuals (charts, diagrams, illustrations) be allowed? Should cueing in the form of numbers be permitted? At the broadest level, no doubt all of these issues involve the question of the extent to which the medium and the technology of the medium should be allowed to shape the material. The issues were far from merely aesthetic, though a series of issues at this level also arose, particularly the extent to which users have to be pleased with the material for satisfactory use.

It is perhaps obvious at this point that the protocol materials developers were about to duplicate the history of many other educational users of technology. Both the documentary issue and the balck-and-white vs. color issue have been fought many times. In the latter issue, only EDC was to remain committed to black-and-white, as it was to insist on documentary realism, the use of hand-held cameras, etc. Other developers were to exhibit a spectrum of attitudes and some were to change their minds, often slowly and only in the face of technical problems, moving toward a convenient blend of practical answers and theoretical positions. In general, developers tended to shift attitudes as they acquired more knowledge of technology and the problems of appropriately using the technology. Thus all but one shifted to using color, while only two developers, Indiana, and the University of

Southern California began with color. One developer shifted from film to filmstrip. The shift to color was prompted by user preference, not by educational value. Indeed, the cost involved would argue for remaining with black and white. The shift from film to filmstrip occurred because the attributes to be shown in that project could be depicted at considerably lower cost with minimal loss of effectiveness. The shift in general to some form of rehearsed instancing of behaviors was prompted primarily by a greater emphasis on the concept-to be-filmed and somewhat by financial limitations. One might film for days before the appropriate behavior appeared on camera. Not all developers parted with unrehearsed behaviors. In these instances they found ways to prompt the behaviors they sought to record.

The question of versimilitude or of realism comes down in the end to the question: is the instancing of behavior realistic or true enough to life to satisfy both developer and user? Do both recognize the behavior as that which occurs in life-situations, and do both accept the replication as a sufficiently accurate and convincing portrayal of life? In addition, the developer must be sure the concept is genuinely embedded in the behavior, while the viewer must be able to identify and recognize the behavior. For the developer who scripts in advance of shooting this frequently means the simplification of elements surrounding the behavior so that the significant attributes have high visibility. For those who do not script it means editing a "slice of life" in order to highlight the concept and remove irrelevant or confusing surrounding behaviors. In other words, the slice-of-life theory of protocols breaks down as the need for clarity of presentation asserts itself.

It would be misleading to suggest that all developers moved in the same directionat even approximately the same period of time in the protocol program. Their starting points varied. Also, production experiences varied, time-frames were different, and the insights garnered were hard-won and frequently fogged-in at first by necessities of deadlines and budgetary restrictions. It was not easy to backup and begin over or even partly to retrace one's steps. It took time for developers to learn to cope with the multiple and sometimes hidden demands placed on them by the technology they employed.

Standards and Achievements

In the end, protocol developers established modes of working which enabled them to check on themselves as they proceeded. They learned before filming to check and recheck the behaviors they were to document by direct classroom observation. They learned to use videorecording as a rehearsal device and to critique the results before actually filming. They learned to listen to scratch tapes of what they had filmed and to make decisions about which rolls of film to develop from such listening, saving money in addition. They became adept in various ways at using the medium instead of being used by it.

The record of what they learned about technology is difficult to document. It is perhaps best revealed by setting down a few minimal standards for each medium for those who would become protocol developers. One distinction must be kept in mind. Protocol materials are intended for distribution, for publication and dissemination. Viable methods of production for research projects are in general inapplicable. Recording on a tape cassette or filming on super 8 Kodachrome or video-recording on a backpack machine--none of these is suitable because the systems of which they are a part are not engineered to produce copies suitable for wide distribution. Certainly copies can be made from materials made this way, but the poor technical quality acts as a powerful deterrent to their use.

For Audiotape, the original recording should be made on a full track quarter-inch recorder using low-noise, low-print tape one and a half mils in thickness (such as Scotch 208) at a speed not less than 3 3/4 inches per second. The machine should have separate record and playback heads, and during recording the recordist should monitor off the tape through good quality headphones. The machine should be in good operating order: the heads should have been cleaned, degaussed, checked for wear, and aligned using a standard reference tape (Ampex, Taber). In addition, the machine should have been properly biased for the kind of tape to be used. The microphone inputs should be low impedence, and the impedence of the microphones should match that of the recorder. General exceptions to the above exist. If two channels are required simultaneously, as in dichotic listening tapes or in material for some language labs, then halftrack recording may be employed. If portability during recording is an important consideration, a recorder employing a narrower tape such as a Nagra SNN may be used. Cassette recorders, especially cassette recorders with built-in microphones, are not to be used. Thinner tape may be used if the event being recorded is continuous and its duration exceeds the recording time of the machine using its largest reels and one and a half mil tape. In general, a unidirectional dynamic or condenser microphone should be used, with a "pop" filter. Noise reduction techniques may be used if available (Dolby, dBx, etc.), and any head tones recommended by the manufacturer should be recorded. Automatic level control devices of the type found in home tape recorders should not be employed, but professional types may be. For example, the Shure Level

Loc ought not to be used, but the Shure SE-30 may be.

For Filmstrips, the original photography should be in thirty-five millimeter and should be on Eastman Ektachrome Commercial, Ektachrome-X, or Professional Ektachrome. No frame should be shorter than 3 seconds, nor any strip longer than 18 minutes or 120 frames. The layout and dimensions of the aperture of the negative should conform to American Standard ANSI PH7.1-1971. The guidelines under Audiotapes also apply to the recording of narration and effects for filmstrips. In addition, two or more masters of the sound track should be prepared on ½" tape. One master should contain audible frame change signals. A second master for automatic advance with tape cassettes should contain no audible signals but incorporate the 50HZ signal system. A third optional master for automatic advance with discs should incorporate the 30/50HZ frame change signal system.

For Films, the original photography should be on a reversal film stock. If in color, this means Eastman 7252, 7241, or 7242. The sixteen millimeter format should be used, with camera aperture position and dimensions conforming to American National Standard ANSI PH22.7-1964. The original should be processed by Eastman Kodak or by a laboratory operating a quality control program with Eastman standards. Under no circumstances should the camera original be projected. Footage shot on Eastman 7241 or 7242, if intended for intercutting with 7252, should be either flashed or lit to a very flat contrast ratio. Eastman 7241 and 7242 should not be used in situations where it was obviously possible to shoot 7252 (for example, in sunlight). The guidelines presented in Audiotapes apply as well to the recording of narration and effects for films. If lip-synchronous filming is to be done, sound should be recorded double system with sound recording done separately from filming on quarter inch tape. A method of insuring sync must be employed, such as operation from the line frequency, matched crystal oscillators, or a sync signal generator on the camera. Sync should not be "faked" in the editing room. Single-system optical sound should not be used. For editing purposes, the sound should be transferred to single perf 16mm magnetic stock on an edge track, with a track width of 200 mils, as described in ANSI PH22. 97-1964. Sound is not to be transferred using a projector. All optical printing is to be wet-gate. The original should be edited to conform to the workprint in alternate rolls (A&B'ed) and the splices should be made on a hot splicer in a facility specializing in this procedure, preferable in the laboratory which will produce the first trial. The black leader employed should have a density of three or more and should be free of pinholes. The print should incorporate an appropriate academy leader and beep. The A & B rolls, the workprint, and all tracks should contain a matching head cap punch in editor's (dead) sync.

In the case of Videorecording, the lack of standardization makes it difficult to be very specific. It is an excellent medium for research work and such instructional purposes as self-analysis of teacher behaviors, but it is difficult to use inexpensively to produce materials suitable for distribution. The developer should secure technical advice from a competent person who has no economic interest in selling him equipment. Beyond the above, it can be said that the original recording should be made on a three-quarter inch cassette machine, such as a Sony 2850, or on a one inch helical scan machine such as an IVC. Larger formats may be used if available. The machine should have been aligned using the manufacturer's alignment tape. EIA sync should be used, or 2:1 sync if EIA is not available. Random sync should not be used. Virgin, first quality, brand name tape should be used.

A light level of a least 60 footcandles should be provided during the original taping. Editing should be done directly from the original tape, and copies made directly from the edited master. A time base corrector should be employed for all duplication. Under no circumstances should any physical splicing be done.

The above description of standards deals mainly with materials and equipment--but it also provides a simple way for a developer to check on the knowledge of the technical people he is planning to employ. While some producers were available who could work effectively with Project Directors, the developers learned that a kind of Hollywoodism can run through the technical side of media production as well as through the talent side. When the protocol developers came to this realization, they learned a basic lesson in the use of technology: they themselves had a responsibility to the medium.

Chapter VI

The Evaluation of Protocol Materials

by Richard Turner

This chapter is divided into two sections. In the first section the various factors entering into the evaluation of Protocol Materials are identified and a matrix of specific types of evidence which might be employed in their evaluation developed. In the second section brief case studies of evaluation procedures employed by Protocol developers are presented and the relation of these procedures to the matrix of evidences discussed.

Section I

Overview of Factors Entering Protocol Evaluation

The aim in evaluating Protocol Materials is to influence confidence in their value as instructional resources. The process of evaluating them requires anticipating, then acquiring a variety of evidences. Each of these evidences should serve to increase (or decrease) overall confidence in the value of the materials.

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The process of Protocol evaluation my be thought of as having five phases: 1) anticipation of future criteria, 2) assessment of audience response, 3) collection of learning data, 4) observation of comparative efficiency and 5) appraisal of purchase and use. With each of these phases are certain roles played by the various audiences to which Protocol Materials are germane. These audiences include the development team ("developers"), instructors and supervisors who might use the materials ("users"), preparatory and in-service teachers, and paraprofessionals who are to learn from the materials ("learners"), and finally, media experts, researchers or evaluators, and scholars in the disciplines from which the concepts are drawn (all labeled "scholars").

The particular roles played by each of these audiences vary with the phase of evaluation and are marked in each phase by specific actions. These actions fall into two general classes. First, there are those that produce opinions or judgments about the acceptability of various aspects of the materials, including the concept used, the media employed, and the content of the Protocol. Second, there are those that yield evidence of the effectiveness of the materials as they are used. The first type of action is associated with phases 1, 2, and 5 of evaluation; the second, with phases 3 and 4.

The specific actions of the various audiences participating in each phase of Protocol evaluation, excluding the "anticipation" phase, each yield a bit of evidence about the value of the materials. These bits of evidence vary in their weight or influence in increasing confidence. None, however, is valueless in contributing to confidence. The influence of each bit of evidence on confidence cannot be appraised exactly. A rough index of value weights may be created, however, if a person is willing to decide how much a particular bit of evidence would influence his confidence. For example, if the evidence would influence him or her only a little, a weight of "1" might be assigned; "2" might be assigned for moderate influence, "3" or even "5" for substantial influence.

By using such a system of weights, one can identify with some objectivity which types of evidence seem to be the more important in the evaluation of Protocol Materials.

Evidence of Protocol Value

The evidences which may be brought to bear on the value of particular Protocol Materials are described in abbreviated form in Figure 1. This figure is organized first according to the phases of the evaluation process. The columns of the figure represent the various audiences to which Protocol Materials are relevant. Each row of the figure represents first, questions which the Protocol developers can ask themselves in anticipating the kind of criteria which need to be met by the materials. Second, it represents answers to these questions if they are to yield positive bits of evidence relative to each type of audience. These questions are grouped according to the principal components of Protocols: the concept to be illuminated, the media to be employed, the actual content of the Protocol, and finally, the uses to which it might be put. In the cells (row by column intersections) of the figure appear statements of the type of evidence which may be obtained from or through each type of audience. In addition, these statements suggest, but do not exhaust, the types of criteria a particular audience is likely to apply in determining the value of a Protocol to them. For example, if a user affirms the concept is important, and affirms it is widely taught, this report provides a bit of positive evidence to the developer about the value of the Protocol (specifically the concept illuminated). It is also likely to reflect two important criteria in the mind of the user, namely, that a Protocol must illuminate a concept which he thinks is significant in his instruction, and that is valued by other professionals in his area. (See Figure 1)

From the viewpoint of the developer, an important variable in planning an evaluation of his materials is the nature of the concept for which a Protocol is to be developed. For example, the concepts "authorial voice", "role conflict" and "reinforcement" belong to different categories with respect to how they might be used by teachers. "Authorial voice" is a concept used for interpretive purposes in teaching literature. "Role conflict" can be considered a substantive concept in teaching social psychology or sociology, but it is also useful to teachers in classifying and helping to diagnose (or interpret) the behavior of students. "Reinforcement" is a substantive concept in psychology and may be used to diagnose or interpret student behavior (as in "Mary seems not to be getting enough positive reinforcement for reading at her desk"); it may also be used (in its verb form) to identify a teacher act or teacher skill.

In general, one can easily identify at least three subsets of concepts relevant to teaching: those related to the subject matter knowledge of the teacher; those related to subject matter but also pedagogically useful in interpreting behavior; and those that belong to both of these two categories and which in addition may be the direct antecedents of teacher actions, hence considered critical to skill learning.

The appropriateness of an evaluation of particular Protocols depends on which of the above categories the concept illuminated belongs to. If the concept is part of substantive knowledge solely, or if it is substantive and may be used to interpret behavior, there is little point in attempting to show either that teachers use this specific concept in the classroom or that this particular concept considered alone is linked to pupil learning, as indicated in the evidences in Phase 3. Although the Coleman data[1] strongly suggest that teachers who know more concepts (as evidences by vocabulary) obtain better pupil learning, there is little reason to think that improved knowledge of any one particular concept will lead to better pupil learning. Rather, it is the total number of concepts known by the teacher that is important. It should of course be true that if a large number of teachers are trained by means of Protocol Materials with attendant increases in the numbers of concepts they know, the pupils of these teachers should learn more than should the pupils of initially equivalent teachers not so trained. To test this type of proposition is not, however, the responsibility of Protocol developers, but rather belongs in the domain of educational reserach.

Unlike Protocol Materials involving concepts that belong only to the knowledge base of teaching, those involving concepts that are the direct antecedents of teaching skills may be evaluated for their influence on teacher behavior and for the influence of this teacher behavior on pupil learning, as suggested in Phase 3 of Figure 1. Some caution must be exercised, however, in interpreting evidences of this type. Since Protocols are intended to improve the learning of concepts rather than to train teaching skills, a failure to influence teacher classroom behavior or a failure to obtain relationships to pupil learning should not greatly decrease confidence in the value of the materials. On the other hand, if Protocol

Materials do influence teacher classroom behavior and this behavior is associated with pupil learning gain, the value of the materials is distinctly increased. A gain in benefits for the materials has been realized. Whether or not a developer will invest in an evaluation to assess these benefits depends greatly on the cost of the evaluation. If the cost of the evaluation is small (e.g., less than the development cost), the potential gain in confidence is undoubtedly worth the investment. If the evaluation investment is large, however, it may offset the value of the benefits, since the probability of showing a substantial positive correlation between a teacher behavior and pupil learning outcomes seems never to be very great.

Figure 1. Criterial Evidence of Value

Phase 1. Anticipation		Phase 2. Audience response Audiences	
Developers	Users	Learners	Scholars
Concept			
Is the concept itself significa to teaching?	Affirm concept is important.	Report concept is relevant/useful.	Affirm validity of literature/research supporting significance. Affirm concept is in network of knowledge needed by student.
Should Protocol be developed for concept?	Affirm concept is difficult for students to master.	Report uncertainty about specific instances of concept in practice (i.e., do not fully grasp concept).	Subject matter expert affirms concept is amenable to "instancing."
Media			
Is the medium selected optimum?	Report technical capability of medium good for concept instancing.	Affirm media facilitated study of concept. Report technical qualities (image, color, sound, etc.)are good.	Media specialist affirms medium chosen can optimize effectiveness.
Protocol content			
Is the Protocol "good" --context realistic? --instances valid? --sequence facilitative to learning? --scope aid to generalization?	Affirm content and organization are "good".	Affirm Protocol was clear, helped understanding of concept, aided learning.	Subject matter expert affirms instances accurately represent concept in context.

Phase 3, Learning data

Developers	Users	Learners	Scholars
Protocol use			
Will the Protocol lead to improved ability to recognize instances of the concept?	Criterion test of concept recognition available; parallel forms of concept recognition test available.	Average learner falls much below mastery on concept recognition pre-test.	Learners taught with Protocol improve mastery and outperform no-Protocol control.
Will the Protocol lead to ability to produce the behavior relevant to the concept (skill-related concepts only)?	User's trainees improve significantly/reach mastery.	Report modified frequency of behavior shown on Protocol.	Pre-post observation of micro-teaching or classroom reveals modification of frequency of behavior.
Does increased use of behavior by Protocol Materials increase pupil learning?			Teacher behaviors modified by Protocol training show correlations with pupil learning.
Does knowledge of concept not directly related to teaching skills correlate with pupil learning?			Knowledge of specific concepts and/or repertoire of concepts held by teacher correlates with pupil learning.

Phase 4. Comparative efficiency

Developers	Users	Learners	Scholars
Are Protocol Materials superior to alternative forms of concept teaching?	User gathers data showing Protocol trained group superior to group trained by alternative method.	Report training by means of Protocol materials more effective than alternative.	Evaluator designs experiment comparing several alternative concept teaching systems and involving different types of students.
Are Protocol Materials more efficient than alternative forms of concept teaching?	User gathers data showing Protocol trained group learns more per unit of		Includes amount of learning and rate of learning per unit of time as criterion variables. Protocol materials are shown to be superior to all alternatives for each type of student.

Phase 5. Purchase and use

Will the materials be purchased (or rented)?	Number of sales or rentals.		
Will the materials	Ratio of buyers/renters to population of potential users. Proportion or number of learners exposed, to total relevant learners.		
Will the materials be "imitated"?	What proportion of potential users produce similar materials on their own?		

Section II

Case Studies of Protocol Evaluation

All of the developers of Protocol Materials have engaged in some form of evaluation; many have additional evaluation activities planned. The general types of evidence sought in these evaluations have elsewhere been summarized by Cooper[2] and will not be reviewed here. The intent of this part of the chapter is to examine the evaluation procedures of three different Protocol Projects, to list some of the specific ways of gathering evidences used in these projects and to point out where problems have been encountered. The projects selected, those at the University of Colorado, Indiana University and Utah State University, differ in the degree of emphasis placed on the various phases, in the extent to which survey versus experimental and quasi-experimental methods have been used, and in emphasis on measurement problems.

These differences in emphasis between projects to some extent reflect differences in the types of concepts chosen for illumination, but they also reflect differences in the assignment of value weights among the evidences. These differences are generally reflected in the following statements which, broadly, represent different orientations among Protocol developers.

1. To succeed, Protocol Materials must obtain very favorable reactions from users and learners (audience orientation).
2. To succeed, Protocol Materials must reliably produce the learning they were designed to produce (learner orientation).
3. To succeed, Protocol Materials must ultimately show their value in changes in pupil behavior (researcher orientation).

No one of these statements denies the truth or validity of the others. The issue, rather, is where time and money will be placed in one's evaluation activities.

The Colorado Project (User Orientation)

Evaluation activity began after the first year of work in this project, at the time when the first film materials and guidebooks were completed.[3,4]

The criteria developed at that time were interest, significance, clarity, sufficiency, perceived effectiveness, and finally, tested effectiveness. The first five of these criteria are audience response criteria (phase 2) and evidence for them was gathered by Likert-scaled items on questionnaires given to both users and learners. The sixth criterion, tested effectiveness, required students to respond to tests developed by the project staff, but administered by the instructors of the students.

The materials to be evaluated against these criteria were based on five very complete "concepts" believed to be relevant for instructors in methods courses; for example, "Conceptualizing the Process of Instruction", "Learners and Their Characteristics" and Organizing Facts to Teach Meaningful Relationships". By any measure, to produce Protocols for such concepts was an ambitious undertaking and reflected some of the early difficulties in distinguishing between Protocol Materials and general instructional films, as discussed in earlier chapters of this book. A "Protocol Package" consisting of a 16mm film and instructor and student guides were developed for each concept.

The evaluation design employed called for pre-tests to be given to five social studies methods classes and five general methods classes which were then to work with all five Protocol Materials packages. There were five additional social science methods classes which would not work with the materials and would thus serve as a comparison group. These classes were drawn from a wide variety of colleges and universities. All groups and their instructors were to complete the questionnaires after each Protocol Package was completed. The post-test (in the same form as the pre-test) was to be given to all groups, including the comparison group, after all packages were completed by the "experimental" classes.

Although this design had technical shortcomings in that students could not be randomly assigned to groups nor could the investigators directly administer the treatments, it had the advantages of using students and instructors from many different locations and approximating the conditions of use typical for instructional materials sold on the open market. Thus, the internal validity of the design was weak, but its external validity was relatively strong.

The problems encountered in the application of this design turned out to be motivational ones for the participants. Only two of the social studies instructors (experiementals) returned all of the requested data; four of the control instructors returned pre-test and post-test data. Within the experimental groups, the number of students responding in each class varied considerably across the Protocol Packages administered, thereby decreasing the total rate of return, if students are considered the appropriate unit of analysis. On the whole the rate of return in this instance may be viewed as a function of the requested work load for the participants.

The problem of obtaining an adequate rate of return from participants in the evaluation of Protocol Materials was a relatively common one in the early evaluation efforts of Project Directors. In the Colorado experience, these problems lead to reducing the complexity of the concepts on which the Protocols were based, and to a reduction in the extensiveness and detail of the evaluation instruments, especially the testing devices.

At a more general level, the early evaluation experiences of the Colorado project point out the importance of considering the relationship of the various types of evidence to be gathered to the potential external and internal validity of the valuation designs chosen. Audience response criteria (phase 1) in the evaluation of Protocol Materials lend themselves to evaluation designs in which external validity, or generalization of the conclusions reached to the population to which they correctly apply, can be enhanced. Obtaining responses from a fair sample of the population depends, however, on keeping the evaluation work load of the participants to a minimum. The coupling of "learning data" or phase 2 criteria to audience response criteria in the same evaluation design, while having the appearance of efficiency, both increases the work load of the participants and creates major difficulties in controlling the exact conditions under which learning (or lack of it) takes place. The first of these two factors weakens the probability of good external validity; while the second weakens internal validity. Such "coupled" designs therefore tend to yield disappointing results from the viewpoint of the Project Director and the evaluation staff.

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*Students were used as the "unit of analysis" or basic observational unit in this design and almost all other evaluation designs involving Protocol Materials. An effective argument can be made that the class of each instructor rather than individual students is the more appropriate unit of analysis.

The Indiana Project (Learner Orientation)

Formal or systematic evaluation of the protocol Materials produced at Indiana University began at about the same time (1971) as those in the Colorado project, but immediately moved toward the acquisition of learning data, while obtaining very restricted data on audience response. The initial study[5] was based on four Protocol films: "Cognitive Interaction," "Affective Interaction", "Counseling" and "Classroom Management." All of these films were conceptually complex in the sense that multiple concepts were presented in them. As part of the evaluation, two different types of study guides were designed to accompany each of the films. One was programmed and self-instructional, the other semi-programmed, but designed to accompany group instruction. Also designed to accompany each film was a test based on "clips" from the film footage not used in the final instructional Protocol. These film clips showed instances and negatives examples of the concepts which were to be learned from the instructional materials. The intent of the test was to determine the extent to which students could correctly discriminate instances of the concepts they were to learn. Finally, a scale was developed to assess student attitutdes toward Protocol Materials.

The evaluation design employed was quasi-experimental, involving two groups of master's students, both under the supervision of the evaluators. One group used the self-instructional Protocol package for all four films, the other the instructor-led packages. The self-instructional group was pre-tested and post-tested on the "film instances" test, while the instructor-led group was post-tested only. Since the students were not randomly assigned to groups, and since only two groups were involved, this design, which is weak in external validity, also suffered serious weaknesses in internal validity. The pre-test/post-test effects were confounded with the programmed learning effects, while the cross comparison of the pre-test for the self-instruction group to the post-test for the instructor-led group suffered from failure to randomize groups. Curiously, this design weakness was significant to the study outcomes.

From the viewpoint of Protocol evaluation, the most serious problem encountered in this study was that the students were able to answer 80% or more of the items correctly on three of the four pre-tests given. This outcome pointed up the difficulties in designing adequate measures of learning outcomes on the one hand, and the unpleasant possibility that the students already had mastered the concepts on the other. This possibility was revealed because a pre-test was given, and might have been missed if a randomized group design, the technically adequate design, had been employed.

The subsequent evaluation moves in the Indiana project[6] were to separate evaluation involving audience response data from evaluations based on student learning. With respect to audience response, the effort was to minimize the work of those persons participating, while maximizing the realiability of the information received. The effort in obtaining student learning data was focused on developing adequate tests of student learning, and improving the validity of evaluation designs employed.

To minimize participant time in obtaining audience response data, a scale of 14 items was constructed for use by instructors, and a scale of 24 items for students. These scales were administered on a pilot basis and items failing to correlate significantly with the total score on the scale were reviewed by a panel, which made the decision to retain or reject the items. This procedure lead to the elimination of four of the items for students, producing a final scale of 20 items, with a reliability coefficient of .89. These items for instructors and for students required about five minutes to complete. These scales were subsequently administered to 18 class groups, involving some 400 students, the instructors of which had requested use of the Protocol Materials. These classes were of three types, pre-service, graduate level, and in-service in school districts, and thus may be viewed as stratified with respect to the level of knowledge of the students in them. All of the instructors returned response data for the Protocol Materials they employed.

The results of this survey of audience response indicated that students and users were favorable to the particular Protocols employed, and that favorability did not vary according to the level of the student, class size or the amount of time devoted in class (beginning with a minimum of one hour) to the materials. For purposes of this chapter, these results are not in themselves to be regarded as salient. The point, rather, is that the procedures used to obtain the responses of instructors and students led to a high rate of return on instruments of known reliability, and enabled the evaluator to produce relevant information about the nature of the audiences and their responses to the materials.

Work on the collection of learning data in the Indiana project was closely correlated with a study by Kleucker (1974)[7] of the comparative effectiveness of Protocol and training materials in bringing about selected teaching skills. To conduct this study, three types of learning criteria were needed: 1) a test of ability to discriminate instances and non-instances in transcripts of classroom interaction, and 3) a micro-teaching test to reveal the extent to which students utilized the teaching skill implied by the concept.

Among these criterion tests, development of the film test, as in the first evaluations done in the Indiana Project, was extremely difficult. The basic problem with this type of test is that, to keep costs within reason, unused footage from the relevant Protocol films must be employed. This footage tends to contain few instances of concepts which might serve as distractors in constructing test items. The items thus tend to be two-choice: either the film clip shows an instance of the concept or, it does not. It is difficult to create multiple discrimination exercises in which the probability of getting an item correct by chance alone is less than 50%, which intrinsically makes the items "easy". In addition, the test films of necessity show the same teachers and students as the Protocol films. Thus the test requires little transfer of training. Written tests involving apparent transcripts of classroom interaction can avoid some of these problems since the transcript material can be varied greatly by the test constructor. The use of micro-teaching as a test of ability to transfer learning from concept discrimination to the acutual production of instances of the concept is relatively simple since the number of instances used by the trainer during a fixed micro-teaching period can be counted. As noted in Section I, however, this type of criterion test of learning can be employed *only* when the concept to be acquired directly undergirds a teaching skill.

The design of the study using these criteria involved four groups to which students were randomly assigned. One group received instruction on Protocol Materials only, one on training materials only, one on both Protocol and training materials and one served as a control. The results indicated that the *control* group answered about 85% of the film test items, and about 80% of transcript test items, correctly. On the micro-teaching test, the average control group student performed at about two-thirds the level of the average experimental group student. On this latter test, the experimental groups significantly outperformed the controls, but this result held only for the protocol and training materials group on the other two tests. Overall, these results strongly suggest that tests based on the recognition or discrimination of instances of a concept as shown on film or by transcript are extremely difficult to construct so that they yield discriminating measures of student learning.

The Utah State Project (Researcher Orientation)

The production of Protocol Materials in the Utah State Project began in 1972-73, with the evaluation of the materials extending from 1972-1974.[8,9] The concepts for which materials were developed were clustered, so that specific sub-concept "Extension" includes the sub-concepts "Prompting," "Seeking further clarification," "Refocusing," and "Redirection." "Encouragement" as a general concept subsumes "General praise," "Specific praise," and "Use of student ideas" as sub-concepts.

This method of clustering concepts together with the type of concepts selected is critical to the evaluation strategy used in the project. First, the concepts chosen were directly related to teacher classroom behavior, or skills, rather than being restricted to the knowledge base of teaching or being "interpretive" concepts. Second, clustering the specific concepts to be learned made possible the development of a protocol film for the entire cluster, which in turn permitted the developer to face the learner with a specific multiple discrimination task. In performing this task, the learner must distinguish which of several possible sub-concepts are occurring in a film segment as opposed to identifying instances or non-instances of a single concept.

The selection of concepts related directly to teacher behaviors permitted the emergence of evaluation which focused on phase three criteria (ability to produce behavior relevant to the concept, relation of teacher behavior as trained to pupil learning), and to a limited extent on phase 4 criteria (comparative efficiency). The clustering of concepts permitted the development of tests of concept acquisition which avoided "easy" items by offering multiple competing response alternatives.

The evaluation strategy which emerged from the possibilities [illegible]insic to the materials was one which focused on the relation of teacher skills to pupil learning as the ultimate criterion, while treating other criteria as intermediate ones, or steps to be taken on the way to the ultimate criterion. Again, this evaluation strategy is possible only under the condition that the concepts chosen directly relate to teacher classroom actions or skills.

To make clear how the intermediate criteria, excluding audience response* are managed in this approach a description of the steps students perform in each of the Utah State Protocol modules appears below.

1. The learner reads a brief description of the concept, which includes a statement of the theoretical rationale underlying the concept, detailed definitions of the behavioral indicators, a review of research relevant to the concept, and a self-check test.
2. The learner completes two recognition practice lessons. These are typescripts of classroom discussions in which the learner must identify teacher use of the behavioral indicators.

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*Audience response data were gathered separately.

3. The learner views the protocol film. Throughout the film, numbers appear immediately before certain teacher remarks. The learner must decide if each keyed remark is an application of the concept and if so, which behavioral indicator is used by the teacher. Learner performance is one of the criteria used in evaluating his mastery.
4. The learner completes a recognition test. This test is a typescript similar to the recognition practice lessons, and is one of the module criteria.
5. The learner completes two application practice lessons. These are typescripts of classroom discussions from which teacher remarks that apply the concept have been removed. The learner must write in an appropriate remark that employs a given behavioral indicator.
6. The learner completes an application test. This test is a typescript similar to the application practice lessons, and is one of the module criteria.
7. Finally, in the case of inservice trainees, learners conduct practice lessons in their own classrooms and record their performance on audiotape recorders. They listen carefully to replays of their own teaching, study them, and attempt to identify points at which the lesson could be improved. (Borg and Stone, 1974, p. 7).[10]

An important characteristic of the steps shown above is that the training procedure and the evaluation of learner mastery of the materials are closely integrated. Moreover, the learning sequence is controlled so that students achieve mastery of the identification-recognition of instances of the concepts to be learned prior to attempting the "application" of the concept (i.e., the production of the specific behaviors to be acquired). In general format, this procedure for instruction is highly similar to that used by Kleucker in the Indiana project under the label "protocol and training materials." The Protocol component is employed to bring about the recognition of concept instances, the training materials to bring about production of the relevant teacher behaviors.

The first evaluation design for testing the principal criteria in phase 3 was single group pre-test/post design. Nineteen practicing elementary teachers were given definitions of the behaviors they were to learn by means of Protocol Materials, and a few days later a 20 minute sample of their classroom teaching video-taped. They then underwent training with the Protocol Materials, as described above, for a total time of 5½ hours distributed over three weeks. After the training, another 20 minute sample of the classroom teaching of the trainees was taken. The frequency of the behaviors on which the teachers had been trained was then observed and coded (blind) for the video-taped pre-sample and post-sample of teaching. The results indicated that the teachers significantly increased the frequency of their behaviors on five of the seven concepts-skills on which training was provided.

As a second component to this study, the magnitude of gain in skill for the teachers taught by Protocol Materials was compared to the gain made by different groups of teachers trained on The Far West

Laboratory's Minicourse 1 and Minicourse 2, in which six of the same behaviors appeared. The results of this comparison suggested that the simpler, and less expensive Protocol Materials produced about the same effect as the minicourses. Thus some evidence of the comparative efficiency of Protocol Materials was obtained.

The internal validity of the study outlined above was weak since no control groups were involved. This defect was remedied, however, in a second study. The design of this study was similar to that in the first study, with four modifications. First, a control group of teachers whose classroom teaching was sampled on a pre-post basis, but who received no training, was included. Second, both the experimental group teachers (n=25) and the control teachers (n=15) taught a specific four-hour social studies unit, for which the instructional resources were provided, to their intermediate grades classes. The pupils in these classes were tested over the unit with both multiple choice and essay tests. Statistical corrections for the socio-economic status and scholastic ability of the pupils and differences in teacher coverage of content were made on the test scores. Third, two additional clusters of concepts ("Clarity" and "Organization") were added to the training, and fourth, the observation time was extended from 20 minutes to 100 minutes. Although all of these modifications are important, the addition of the pupil learning criteria was most significant in that a new type of evidence hearing on Protocol value was gained.

The results of the study indicated that the experimental group teachers gained significantly on all 12 of the behaviors on which they were trained, while the control group gained on only four of these behaviors. In addition, correlation of the frequency of these behaviors among teachers to pupil learning gains (corrected) showed the expected sign in all cases and achieved significance for six of the twelve behaviors.

As thoroughgoing as this second study was, it still contained some design weaknesses. First, the teachers involved all taught in the same schools, thus permitting the trained teachers to influence the untrained. Second, the teachers were not randomly assigned to their particular group, nor were the pupils randomly assigned to teachers. Thus some doubt can be cast on the outcomes.

Overview of Cases

As evidenced in the three case studies presented above, the evaluation of Protocol Materials is in practice an inexact science. It has not proceeded by conducting conclusive tests against highly developed criteria, but rather by gathering some evidence of value on a variety of intuitively valid criteria. The types of evidence obtained appears to depend on the orientation of the developer, the specific type of concepts portrayed in the Protocol Materials and on the financial resources available for evaluation activities.

At present, there are more criteria against which evidence might be obtained than any one developer has actually employed. Nonetheless, very substantial evidence exists that carefully developed Protocol Materials obtain favorable audience responses, that they can produce significant changes in teacher behavior, and that in certain instances, the behavior changed is significantly related to pupil learning outcomes. The processes which may be used to obtain these evidences are reasonably simple and direct and are fully within reach of other persons who wish to engage in the development and use of these materials with some assurance that they are of value.

FOOTNOTES

[1] Coleman, James S., et.al., Equality of Educational Opportunity, Washington D. C., U. S. Government Printing Office, 1966.

[2] Cooper, John E., "A Survey of Protocol Materials Evaluation", Leadership Training Institute for Educational Personnel Development, University of South Florida, 1974 (mimeo).

[3] Smith, Mary Lee, "Evaluation Report of the 1970-72 Protocol Materials Units", Center for Education in the Social Sciences, University of Colorado, 1973 (mimeo).

[4] Driscoll, Laura, "Draft of Evaluation Instruments for 1974 Field Test", Protocol Project, University of Colorado, 1974 (mimeo).

[5] Cunningham, Donald J., et.al., "A Preliminary Evaluation Report on the Development and Use of Filmed Protocol Materials within Two Instructional Strategies", Indiana University Protocol Project, 1971 (mimeo).

[6] Pugh, Richard, "User Reactions: Concepts and Patterns in Teacher-Pupil Interaction", Indiana University Protocol Project, 1974 (mimeo).

[7] Kleucker, Joy, "Effects of Protocol and Training Materials", National Center for the Development of Training Materials in Teacher Education, Indiana University, 1974 (mimeo).

[8] Borg, Walter R., "Selected Tables from the Utah State University Protocol Project Field Test Reports", AACTE Meeting, Chicago, February 1974 (mimeo).

[9] Borg, Walter R. and Stone, David R., "Protocol Materials as a Tool for Changing Teacher Behavior", Journal of Experimental Education, (in press), also mimeo, Utah State University, Logan, 1974.

[10] ibid.

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2 Borg, Walter R. and Stone, David R., "Protocol Materials as a Tool for Changing Teacher Behavior", *Journal of Experimental Education*, (in press),

3 Coleman, James S., et. al., Equality of Educational Opportunity, Washington D.C., U.S. Government Printing Office, 1966

4 Cooper, John E., "A Survey of Protocol Materials Evaluation", Leadership Training Institute for Educational Personnel Development, University of South Florida, 1974 (mimeo).

5 Cunningham, Donald J., et. al., "A Preliminary Evaluation Report on the Development and Use of Filmed Protocol Materials within Two Instructional Strategies", Indiana University Protocol Project, 1971 (memo).

6 Driscoll, Laura, "Draft of Evaluation Instruments for 1974 Field Test", Protocol Project, University of Colorado, 1974 (mimeo).

7 Kleucker, Joy, "Effects of Protocol and Training Materials", National Center for the Development of Training Materials in Teacher Education, Indiana University, 1974 (mimeo).

8 Pugh, Richard, "User Reactions: Concepts and Patterns in Teacher-Pupil Interaction", Indiana University Protocol Project, 1974 (mimeo).

9 Smith, Mary Lee, "Evaluation Report of the 1970-72 Protocol Materials Units", Center for Education in the Social Sciences, University of Colorado, 1973 (mimeo).

10 Turner, Richard L., "Progressive Evaluation of Protocol Materials Development", National Center for the Development of Training Materials in Teacher Education, Indiana University, 1971 (mimeo).

Chapter VII

The Use of Protocol Materials

By

Richard Turner

The purpose of this chapter is to examine the use of protocol materials as a type or class; it therefore assumes that they will be developed in the future and may ultimately become a standard feature of teacher education programs. Beginning with this assumption, the chapter is developed in two parts. The first focuses on the role of protocol materials in helping instructors achieve program goals in teacher education. The second part examines three instructional systems in which protocol materials may be used to help achieve these goals.

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Protocol Materials and Program Goals

An important distinction to be made in planning for and using protocol materials is between the immediate or behavioral objectives associated with the use of individual protocols and the long-range goals of teacher education programs. Behaviorally, the objective in using a particular protocol is to have teachers recognize, with high accuracy, instances of a specific concept useful in teaching. When several individual protocols are used in class, the instructor's objective for the class is almost always multiple discrimination -- distinguishing the characteristics of each concept from the others.

The behavioral objectives attached to specific protocols describe only the earliest steps toward the program goals of teacher education. Although these goals are indeed behavioral in the sense that they address ways in which teachers are to act, they are also distinctly theoretical. They posit relationships between the thinking of teachers, their overt actions and desirable changes in the behavior of students.

Diagnostic Thinking as a Program Goal

One set of hypothesized or theoretical relationships underlying program goals in teacher education can be simply represented in diagrammatic form as shown in Figure I.

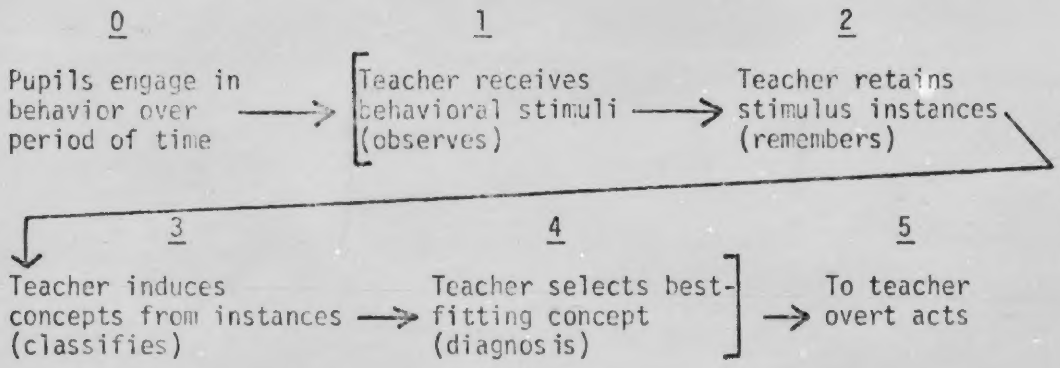
0
Pupils engage in behavior over period of time
1
Teacher receives behavioral stimuli (observes)
2
Teacher retains stimulus instances (remembers)
3
Teacher induces concepts from instances (classifies)
4
Teacher selects best-fitting concept (diagnosis)
5
To teacher overt acts

Figure I. Steps related to teacher diagnostic thinking.

In Figure I, steps 1 through 4 are all inside the teacher and represent cognitive processes or thinking. Of these steps, 1 and 2 involve substantial attention and memory efforts since pupil behavior is continuous and extends over long intervals in the classroom. Steps 3 and 4 represent mediational processes, that is, intellectual operations through which are interpreted the meaning of the remembered stimuli and the potential utility or value of different ways of classifying them.

In spite of the fact that the steps noted above are not visible ones, they undergird two important goals of teacher education programs. One is to instill in teachers the habit or trait of attending to and remembering the behaviors of their pupils, hence to be close observers and recorders of pupil behavior. The second is to expand the repertoire of concepts which the teacher can use to classify these remembered behaviors. These two goals are assumed to be necessary but not sufficient antecedents to a third program goal in teacher education: to have teachers regularly diagnose the state and status of pupils along a wide variety of cognitive, affective and interpersonal behavioral dimensions.

The reason that observing, remembering and classifying pupil behavior are viewed as necessary to diagnosis but not quite sufficient for it is that "diagnosis" implies a set of reasonably powerful concepts; concepts which are not commonplace or stereotypic, but which add useful information about the state of pupils, and which can be connected to procedures by which this state can be modified, or corrected if a deficiency is involved. The "power" of a concept does not depend only on whether teachers understand it, but also on the position of the concept in instructional science.* As this science improves, the concepts in it will both change and become more powerful. It is for this reason that protocol materials must be regarded as a class, the particular instances of which will grow and change with future developments. As instructional materials, protocols cannot be used to increase the power of the concepts they illuminate. That is a task for educational research. They can, however, be employed to improve the diagnostic acts of teachers within the boundaries of current knowledge.

Relative to program goals related to diagnosis, a good instructional move is to group or cluster protocols according to the type of pupil behavior to be diagnosed, for example, reading, doing mathematics, behavior in classroom groups, self-concept, language usage, level of cognitive development, and the like. The initial purpose of groupings of this kind is to train teachers to accurately observe pupil behaviors related to the broad instructional areas of schooling. The second purpose is to facilitate the development of repertoires of related concepts in teachers. For example, the diagnosis of student skill development in reading requires a repertoire of reading-related concepts in the teacher. These concepts belong to families or groups. The point here is that concepts in these families are not best learned by teachers on a random or hit and miss basis, but rather, within a cognitive structure as members of a group or family.

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*The problem of isloating powerful concepts for teachers to learn is addressed in detail by Hudgins in Chapter 4.

To see this point more clearly, the steps shown in Figure I can be expanded to illustrate a particular case as shown in Figure 2.

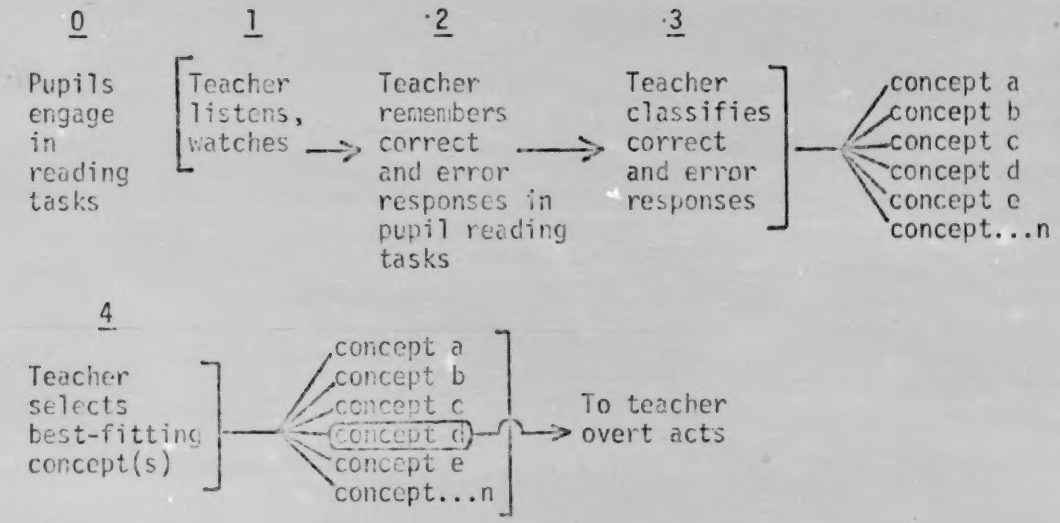
0
Pupils engage in reading tasks
1
Teacher listens, watches
2
Teacher remembers correct and error responses in pupil reading tasks
3
Teacher classifies correct and error responses
concept a
concept b
concept c
concept d
concept e
concept...n
4
Teacher selects best-fitting concept(s)
concept a
concept b
concept c
concept d
concept e
concept...n
To teacher overt acts

Figure II. Expansion of steps in teacher diagnostic thinking

An especially good example of existing protocol materials which follow the paradigm shown in Figure 2 are those developed at Bucknell University, using reading skills in "developmental reading." In these protocols, pupils engaged in reading tasks are shown on film (step 0). The teacher trainees are given instructions to observe (step 1) the reading behavior of the pupils. In watching the film, the trainee is cued to the reading skills indicators (error and correct responses, aid to memory in step 2) and the indicators are associated with the particular type or class of skill. In classifying the indicators shown in each short protocol film, the protocol developer-instructor initiates the process of building up the repertoire as indicated in step 3. Protocol a builds concept a, protocol b builds concept b and so on through the set of concepts which comprise the reading skill classification in developmental reading. Thus, as a set, the Bucknell materials are intended to build a specific repertoire of concepts related to pupil reading behavior. Other repertoires related to reading can of course be developed through the use of other systems of concepts and attendant protocol materials.

The diagnosis of the state or status of the pupil, as in step 4, is a complex and poorly understood cognitive act. For purposes of the present chapter it is assumed that, at the minimum, this act requires the successive fitting of concepts within a specific repertoire to the remembered behavioral data until the best-fitting concept is found. This concept can then be used as the diagnostic category by the teacher. One may easily imagine, however, that none of the concepts within a particular system such as that used in the Bucknell Materials, fit all of the pupil reading behaviors observed by the teacher. To obtain a better fit, the teacher must presumably introduce additional concepts drawn from other repertoires. Thus the goodness of the diagnosis in step 4 may be viewed as a function of the number of repertoires of concepts over which the teacher has control as well as the power of the concepts in each repertoire.

The development of protocol materials to train teachers directly in complex acts of diagnosis, that is, those involving the potential to apply more than one repertoire of concepts, has not been widespread. The development of protocols for this use is important, nonetheless, and describes a significant area for future activity if the program goals of teacher education in diagnosis are to be achieved.

Teacher Overt Acts as a Program Goal

A second set of program goals in teaching are attendant to overt teacher acts. Most of these acts occur in the classroom with pupils, but some may occur in conferences with parents, or work with peers or administrators. The classroom acts with pupils may hypothetically be said to belong to two types: 1) those that follow the diagnostic acts of the teacher, as described in the preceding section, and 2) those that are associated with presenting or giving instruction but are not preceded by a clear-cut diagnosis by the teacher. In practice, however, this distinction is a difficult one to maintain since the actual acts made by the teacher seem functionally to belong to the same set. For purposes of this paper, this hypothetical distinction will therefore not be maintained; rather, the writer will act as if acts following diagnosis and acts involving presenting or giving instruction are drawn from exactly the same repertoires.

The role of protocol materials in the development of teacher overt acts rests on the premise that a program goal in teacher education is first to expand the repertoire of possible teacher actions and second to increase the probability that, in actual teaching situations, a teacher will select from this repertoire the most appropriate acts. Parallel with the preceding section on diagnosis, accomplishing this goal involves certain theoretical assumptions. One group of assumptions bears on acquiring accurate concepts of the acts themselves and developing a repertoire of these acts, while the other group bears on the appropriateness of particular acts in specific teaching circumstances.

Acquiring Accurate Concepts of Acts

The acquisition of concepts of teaching acts by means of protocol materials rests on relationships originally hypothesized by Bandura and Walters in social learning theory (1963)[1] and subsequently developed for teachers by MacDonald and others (1972)[2]. The steps for a trainee to acquire a concept of a teaching act are as follows: 1) observation of a teacher modelling the target act, 2) cueing the trainee to identify criterial characteristics of the act, 3) observing the consequences of the act on pupils, 4) discriminating the target act from other acts, and 5) practicing the target act. Of the steps, the first four can be accomplished through the use of protocol materials, while the fifth usually requires role-playing, micro-teaching or actual teaching. Hence, in the final step, the trainee is himself producing the behavior of the teacher model observed in step 1. Although this final step may not be critical for the acquisition of a concept in its verbal form, this step is usually needed to verify that the student has mastered the concept at an operational level.

The aggregation of acquired concepts of teaching acts into repertoires or families of acts represents a program goal in teacher education to which currently developed protocol materials are not yet completely adapted. One approach to this problem is the clustering system used by Borg and described in the preceding chapter on the evaluation of protocol materials. A second approach is that employed in the protocol project at Michigan State University. In this approach, teaching is viewed as problem-solving behavior, and the concept repertoires are organized around broad functions of teaching, including setting objectives, diagnosing, instructing and evaluating. A similar approach is employed in the General Catalog of Teaching Skills (1974)[3], except that approaches to or models of teaching by subject areas and developmental levels are laid over the broad functions. Thus concepts are clustered simultaneously by teaching functions, approaches to teaching, and subject areas. A fourth approach is presented by Hudgins in Chapter 4.

None of these approaches to identifying relevant families of teaching acts is entirely satisfactory from an intellectual viewpoint, although each approach suggests useful leads for clustering protocols in the attempt to build repertoires of concepts undergirding teacher overt acts. At this stage of development instructors who wish to utilize protocol materials to achieve this program goal must be prepared to devote some time to organizing the materials into groups or families to develop the repertoires they think most valuable.

Appropriate Teaching Acts

Training teachers to select appropriate teaching acts in the classroom context, as opposed to developing repertoires of potential acts, lies at the very edge of the use of protocol materials. Why this is the case may be illustrated in diagrammatic form as in Figure 3. In this figure, a repertoire of diagnostic concepts is shown on the left, with the concept selected by the teacher encircled (as in step 4 or Exhibit II). On the right is shown a repertoire of teaching acts. None is circled. In the middle is a question mark. This question mark represents the problem of selecting an act or set of acts which fits the diagnosis made.

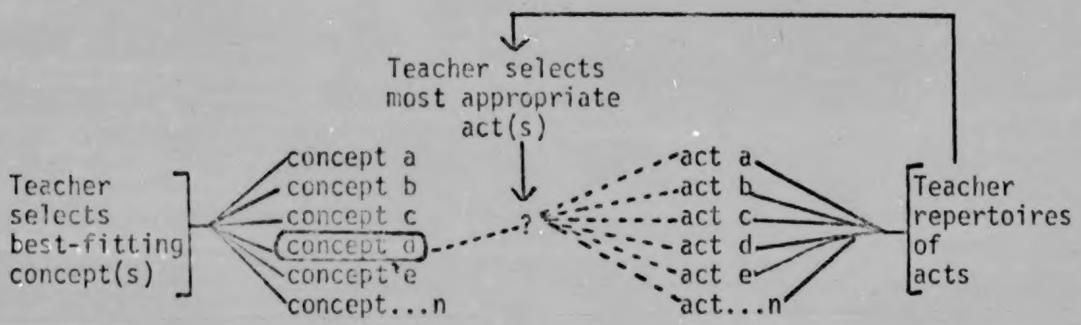
Teacher selects most appropriate act(s)
Teacher selects best-fitting concept(s)
concept a
concept b
concept c
concept d
concept e
concept...n
?
act a
act b
act c
act d
act e
act...n
Teacher repertoires of acts

Figure 3. The problem of selecting appropriate acts from a repertoire

In a perfectly developed science of instruction, this question mark would not appear. A diagnosis of the state or status of a pupil or pupils would be followed by a prescribed set of acts for moving pupils to the next objective, or, if a deficiency were involved, for correcting the deficiency. It is precisely the inability to give this prescription which characterizes current knowledge. While protocol materials cannot correct this inability, they sometimes can be used for purposes of critiqueing teacher acts shown in the protocols and for examining alternative acts, hence for reviewing and studying the elements in various repertoires. This use of protocol materials departs from their standard use for teaching concepts, and approaches the use originally foreseen in making vignettes of classroom practice in which multiple concepts (or teaching acts) were illustrated in the "slice of life" shown. The use of protocol materials in this way cannot directly achieve the program goal of having teachers select appropriate actions. It may facilitate this goal, but to attain it, teachers must practice directly in the classroom with feedback concerning the appropriateness of their actions.

Summary, Program Goals

The mastery of single concepts as the immediate objective in using individual protocols should be distinguished from the use of protocol materials to help achieve program goals in teacher education. From the viewpoint of protocol use, these goals include first, developing in teachers repertoires of concepts useful in diagnosing pupil behavior, and second, developing repertoires of teacher acts. A third program goal, to have teachers select appropriate classroom acts relative to the diagnosed state or status of pupils, can be facilitated through the use of protocols, but, under the limits of current knowledge, cannot be completely achieved by them.

The Use of Protocol Materials in Instructional Systems

An important consideration for college instructors of in-service personnel who wish to use protocol materials is the type of instructional system in which the protocols are to be employed. For present purposes, an instructional system may be defined as having five components: 1) objectives and goals, 2) instructors, 3) materials (including printed matter and technological devices), 4) students, and 5) time. In a system, these five parts may be treated as correlated variables in that a change in one or two key parts substantially changes the values of the remaining parts.

One key component of instruction for both instructors and students is time. Part of instruction time is shared by instructors and students, that is class time; part is wholly instructor time, that is predominately preparation time; and part is wholly student time, that is study time. Associated with time are costs. Some of these costs are direct dollar costs, and some are opportunity costs, that is, costs which come about because choosing to engage in one activity precludes engaging in an alternative activity at the same time. Thus, the opportunity to engage in the alternative is foregone and any gain, qualitative or quantitative, is also foregone. Foregoing a potential gain is calculated as an opportunity cost. A distinct feature of the use of protocol materials is that they take up time, probably substantially more time than reading about concepts in textbooks. Thus time is an issue in planning to use protocol materials.

A second key component of instruction is materials. Like time, materials involve costs. Some of these costs are directly associated with the materials actually used in instruction, while some are associated with the technology required to support instruction. Because most protocol materials are on film, have student study materials to accompany them, and require some supporting technology, they clearly involve some materials costs.

A central fact of all instructional systems is that they involve trade-offs between costs and the achievement of goals. The objective in choosing an instructional system is to maximize goal achievement while minimizing costs. Efforts to achieve this objective are constrained by circumstances, however, so that under some circumstances particular trade-offs, desirable or not, are difficult to avoid. The remainder of this section is devoted to the examination of these instances of instructional systems and their surrounding circumstances.

As an aid in keeping in mind the main components of the instructional systems under consideration, Figure 4. shows these components and illustrates some of the differences in the expected trade-offs within each system.

In Figure 4, the three instances of systems are shown in the layers or strata (1,2,3) while the components are shown in the sections (a,b,c,d). Component a deals with goals and objectives, specifically the opportunity costs of goals and objectives foregone under each system. Section b represents class time, which in this case collapses instructor time and class time into a single category (preparation time of students and instructor is assumed to be a close correlate of class time). Section c shows study time for students, while section d shows materials costs. The changes in the widths of the sections between the three systems are intended to illustrate the various trade-offs, hence giving some indication of the advantages and disadvantages of each system.

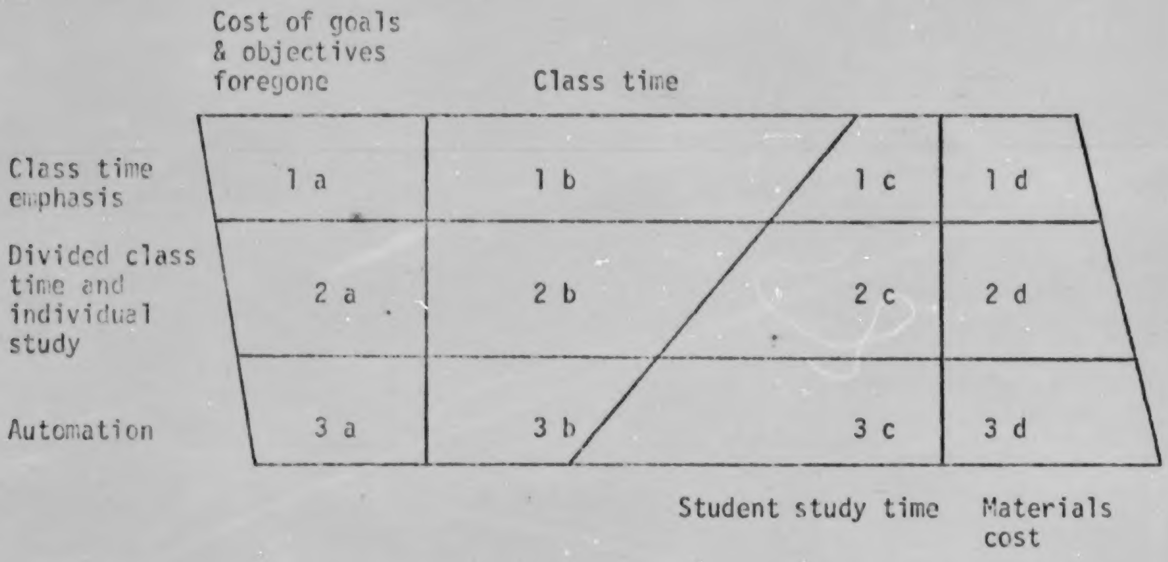
Cost of goals & objectives foregone
Class time
Class time emphasis
1 a
1 b
1 c
1 d
Divided class time and individual study
2 a
2 b
2 c
2 d
Automation
3 a
3 b
3 c
3 d
Student study time
Materials cost

Figure 4. Trade-offs in instructional systems using protocol materials.

System 1. Class Time Emphasis

This system represents that which is typical in the current use of protocol materials. In it, the instructor decides to use class time to show each of several protocol films. This choice involves introducing the films and usually requires some discussion of the film content with either small groups or the class as a whole, and frequently requires the completion of some form of written materials to increase student mastery of the concepts. The minimum time per concept (per protocol) under these circumstances is at least 50 minutes, or one class period. In addition, if the instructor uses class time to pre-test and post-test students over each concept, at least an additional 50 minutes will be involved, and quite likely, more than 50 minutes.

Assuming that the average course in teacher education encompasses about 45 hours of classroom instructional time, an instructor who chose to use as many as 10 protocols, each teaching one concept, would encumber from 25 to 50 percent of class time on these concepts. This large proportion of class time is represented in area 1b in Exhibit LV. Area 1c, on the other hand, represents the amount of student outside study time related to protocol materials. This time might be used for students to work on supplementary materials accompanying the protocol films, or to read textbooks or other adjunct materials associated with the protocol materials.

The use of a system of this kind may be viewed as minimizing both materials costs (1d) and student opportunity costs (1c). The materials required would be a projector and screen, the protocol films, and any supplementary printed matter. On a per student basis, these costs are extremely small. Student opportunity costs are also small since the student is not required to spend long hours of study out of class, and can therefore engage in other activities to which he may attribute value. The trade-off for these minimized costs, however, is the erosion of goals and objectives either by foregoing some of them, or by giving some very cursory treatment. If the goals of the program are to build repertoires of diagnostic concepts or of teaching acts, some repertoires would either have to be deleted from the program or left in a poorly developed state. If other goals are included in the program, these goals would be similarly affected. In sum, this type of system increases the opportunity costs of students and instructors in the sense that goals and objectives which might have been attained must be forgone. Collaterally the system fails to optimize the attainment of goals and objectives as the desired outcome. This effect is represented in area 1a of Exhibit IV.

Although System 1 may seem rather inadequate in the above treatment, under certain circumstances it has distinct advantages. First, in most in-service training contexts, teachers have little outside time for study in addition to their usual preparation. Second, many in-service programs are poorly funded,* hence materials costs must be kept low. Third, the objectives and goals of in-service programs can be more sharply targeted than in pre-service education programs since practicing teachers already have developed substantial repertoires of acts and some diagnostic concept repertoires. Thus the amount of content to be covered relative to goals and objectives is a less pressing issue than in pre-service programs.

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*Judged from a result of a survey of these programs made by James Walden at the National Center for the Development of Training Materials in Teacher Education, Indiana University, 1973.

A second set of circumstances in which System 1 may be advantageous is in pre-service programs in which the students already have achieved substantial repertoires of concepts and acts, but need sharply defined help to master certain difficult concepts or acts. In these instances, using direct classroom instruction with protocol materials is likely to be as efficient as any alternative system.

The context in which System 1 is disadvantageous is in the early and middle stages of pre-service programs involving undergraduates. It is disadvantageous not only because it entails foregoing program goals, but more importantly, because it fails to optimize the use of student study time outside of class when the opportunity cost in utilizing this time is almost always small, i.e., students typically have little to gain from alternative uses of their time (Perlberg, 1973).

System 2. Divided Class and Individual Study

In this system the instructor attempts to balance the components of the system. Beginning to the right of Exhibit IV with materials costs (2d), two choices are available. The first is to have students purchase and use outside of class printed materials, usually in programmed form, which accompany protocol materials. As noted in the description of the Utah State University materials in Chapter 6, these materials would describe the concept, and provide practice exercises, recognition tests and applications. The showing of the protocol film in a class contest appears following the preliminary practice exercises done individually, and prior to the applications, also done individually. Under this choice, the cost of the protocol film and projector to the instructor (or institution) are the same as in System 1, while the cost of the individual study materials are borne by the student.

The second choice is to create a learning laboratory associated with class instruction. This system is used by the protocol development group at Michigan State. To be useful for instruction involving protocol materials, such a laboratory must usually contain more than one 16mm projector, and may include facilities for slide and tape presentations, since some protocol materials are in these forms. To reduce costs, viewing areas should be large enough to accommodate small groups rather than just individuals. Having only individual study carrels equipped with the necessary technology tends to increase costs since students are likely to queue up at carrels at certain hours of the day, thus placing demands to have an ever greater number of carrels available. Arranging for students to view materials in small groups reduces this demand. A cost associated with learning labs is for monitoring and supervision. Unless supervision is present, damage to equipment and film or tape materials is likely to be substantial.

The use of a learning lab for studying protocol materials is flexible. If the materials to be studied are of middle difficulty, or even "easy" for students, (but still needed for purposes of review or the consolidation of learning) all protocol study may occur in the lab, freeing class time for the more general study of the theoretical systems into which the concepts fit. If, on the other hand, some of the concepts are very difficult, the instructor may wish to utilize class time to give detailed attention to these concepts.

In one perspective, the use of a learning laboratory may be seen as a way of stretching class time so that direct instructor time is decreased while student study time, under controlled conditions, is increased. Student study or reading time outside of either class or laboratory can of course be maintained. This system is thus parallel to that used in the physical and biological sciences, in which the student load is heavy and consists of a class-lab-individual study arrangement.

The two choices concerning materials (and equipment) discussed above are both aimed at reducing the goals and objectives foregone, hence attempting to optimize 2a, through the mechanism of reducing direct class time (2B) while increasing student study time (2c). The system thus has the effect of increasing student opportunity costs. Materials costs are also increased in this system, but the magnitude of increase depends on whether the instructor chooses the programmed learning alternative or the learning lab alternative, or perhaps some combination of these alternatives.

The advantages and disadvantages of System 2 vary with the instructional context. As the evaluation studies at Utah State suggest, the use of programmed learning materials for individual study together with group showings of the Protocol Materials, is a highly workable alternative in in-service settings. Whether or not this alternative would work in pre-service settings with novice preparatory teachers, studying over extended periods of time, and attempting to attain multiple objectives and goals, is an unsettled question. The learning laboratory approach, on the other hand, has been shown to be highly workable at Michigan State in a competency-based course designed for beginning preparatory teachers. To create the laboratory system, however, Michigan State instructors had to limit the number of students in the course and make a very great effort to obtain the funds necessary to build and equip a laboratory sufficient to handle these students. Whether or not a laboratory approach would work in an in-service setting undoubtedly depends on the density of the population of teachers who could travel to the lab, and on the time available to this population for travel and study away from home or school.

System 3. Automation

The use of Protocols in an automated instructional system is slightly futuristic, but is fully within the realm of possibility and is now in the trial stage at Indiana University. The beginning of this system must be focused on materials and equipment (3d) and on instructional development (incorporated as instructor time in 3a). To have an automated system, the basic filmic or video tape materials (Protocols) must first be available at relatively low cost. Otherwise, the expense of the system will be beyond reach at the outset. Next, a computer assisted instructional system must be available at a reasonable cost. "A reasonable cost" means that the CAI system is already available in the institution in which an automated system is projected, and that instruction based on Protocol Materials will be entered as only one portion of this total system.

If these two conditions can be met, the next problem is to interface the CAI system with the instructional system for Protocol Materials. To solve this problem at least two, and typically four, pieces of equipment must be available: 1) an interactive computer terminal, 2) a video playback and monitor unit (TV screen) which can be controlled through the terminal. Currently, terminals through which video playback can be directly controlled are extremely rare, thus an interfaced control unit or accessing unit between the terminal and the video playback is required. Video playback unit with a separate monitor is the more likely combination.

The physical arrangement of this equipment must be such that the student sits at the terminal keyboard and faces a cathode ray tube or a plasma display screen, or possibly a teletype printer, through which instructions and substantive content are transmitted. Of these display devices, the plasma screen is best, and the cathode ray next best since these units display characters at a rapid rate. Adjacent to the terminal, within reach of the student, must be the interfaced control by means of which the video tape can be accessed at any point, either by computer signal or by the student. The TV monitor must be located in this environment so that the student can glance from the terminal display and the video screen must be within very easy visual access is that no currently available terminal can display rapid motion as required by film or video.

The instructional development aspect of this system lies in determining the type and sequence of instruction to be stored in the computer, which now can stand in the place of the instructor for part or all of Protocol instruction. Making this determination requires the instructor to consider in detail what his overall strategy is for attainment of those objectives and goals in teacher education for which he is responsible. In the view of the writer, and relative to the goals discussed in Section I, a good strategy would be characterized along the following lines. First, class time should be reserved for the treatment of theoretical materials and concepts which cannot be pictured or shown by means of Protocol Materials, and for those steps in the acquistion of concepts or acts which require enactments. Second, a student reading or study time should be devoted largely to the theoretical material within which the concepts are embedded. Third, the automated instructional system involving Protocol Materials should carry the burden of concept learning, and testing for concept acquisition.

It follows that the materials to be stored in the computer are first, those which train directly for discrimination of the criterial attributes of the concept, and second, those which test whether or not these discriminations are being or have been made in the students' viewing of the Protocol Materials. Thus, extended reading material stored on the computer is to be avoided. Finally, careful sequencing of the material stored and/or the order of the Protocols on the video tape can be used to facilitate the acquisition of groups or families of concepts. Indeed, with careful planning, pertinent sub-sets of concepts can be stored on a one-hour video tape so that a student's time on the automated system can be focused on the acquisition of part, or perhaps all, of a concept repertoire.

The intent of an automated system of instruction using Protocol Materials is to minimize the goals and objectives which would be foregone (3a in Exhibit IV) in alternative systems, hence to optimize the attainment of the full range of goals. This intent is accomplished in this system by minimizing the class time devoted to Protocol Materials (3b) while maximizing the investment of student time in a highly controlled learning environment. The trade-offs for these accomplishments are, first, greatly increased materials costs (allocated almost entirely to equipment and computer time), and increased student opportunity costs (3c).

At the present time, an automated system for using Protocol Materials is probably not advantageous in any context. This is true in part because there are not enough Protocol Materials to give extensive instruction in any one aspect of teacher education, thus under-utilizing the automated system, and in part because of the equipment costs associated with the system are great. However, over the long run, an automated system has very substantial potential to greatly increase the effectiveness and productivity of teacher education and for this reason should be given continued attention and development.

Summary

Two important program goals of teacher education are to develop repertoires of concepts useful in diagnosis of pupil states and status, and to develop repertoires of teacher acts. Protocol Materials may be used in the attainment of both of these goals. The actual accomplishment of program goals requires that Protocol Materials be used within some type of instructional system. Three such systems were discussed; the first utilizes class time for instruction with Protocols, the second class and laboratory time, while the third is automated. Each type of system involves different trade-offs between costs and program goals, and is advantageous under certain conditions but disadvantageous under others.

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Chapter VIII

Protocols and the Uses of Research Knowledge

By B. Othanel Smith

One of the most frequent complaints of educational practitioners, particularly teachers and principals, is that the results of research and theories of learning and teaching are useless when applied to practical school situations. Even those persons who do research and teach theories, it is claimed, typically use neither in their classrooms nor in designing programs of teacher education.

There can be little doubt that theoretical work in education as well as the results of research typically go unused. This is supported by the testimony of teachers themselves, as well as by research, and by the character of programs of teacher preparation. Evidence favors the view that teachers use the concepts of psychology and philosophy little if at all when they discuss the problems of the classroom and the school. Concepts and principles underlying educational practice are typically taught by lectures and discussion and illustrated with verbal examples. Courses in philosophy and the social aspects of education as well as in educational psychology are used as often to criticize school and classroom practices as to describe more effective ways of carrying on the educative process.

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Why do practitioners not use the available theoretical and research knowledge? According to one view, the failure to apply theoretical or research knowledge to improve instruction is attributable to the lack of familiarity with such knowledge on the part of school personnel. Programs of teacher preparation, according to this view, provide neither an opportunity for teachers and administrators to study the research relevant to their work nor the concepts and principles needed to understand the literature. Those who take this position often insist upon the inclusion of research courses in programs of preparation. This remedy suffers from a fundamental flaw. To understand research results is not the same thing as knowing how to use them in practical situations. Another answer emphasized that the body of knowledge in question is inherently inadequate as a basis of educational practice. If one takes this view of the matter, he is likely to deplore the methodology of research and to call for some new mode of investigation more appropriate to the problems of the school and the classroom. This is a plausible position that enjoys considerable support by the critics of educational research. It is painfully clear that a great deal of research in education yields results which are not generalizable from the sample to a wider population. The repeated occurrence of this dificiency is leading an increasing number of research workers to question the methods of educational inquiry.

Protocols and Types of Knowledge

Nevertheless, it would be indefensible to discard all theoretical formulations and research findings. It would be strange indeed were the work of outstanding theorists and researchers of the last seventy-five years completely worthless. While granting the probability that research methodology is in need of reconsideration, it is justifiable to hold that some research knowledge and theoretical conceptions and principles are not only applicable to school problems but also capable of yielding effective practices. If one takes this view, he must face a number of questions. He must ask what are the kinds of knowledge potentially useful to the practicing school personnel? It is not enough simply to raise the question of how knowledge is to be applied to school situations. One must raise the more specific question of how particular kinds of knowledge are to be used and to what ends. The first task, therefore is to consider the types of knowledge that make up the content of educational literature. When these have been isolated and illustrated, one must then face the question of how the types of knowledge are applied. These are general questions which require only a brief exploration here. When they have been dealt with, it is then possible to consider the question of how Protocol Materials can be used as instruments for learning to apply particular kinds of knowledge in various types of situations.

What are the types of knowledge? The first type is referred to here as factual. The term "fact" is vague and subject to a number of usages. Sometimes the term is used to assert that something is true as when someone says that it is a fact that Notre Dame's football team was rated number one in the 1973 season. At other times it is interpreted as reality. While facts are always true statements, the use of the term here designates a particular type of knowledge; namely, information about particulars.

The simplest definition of fact is a statement verified by direct observation. If a teacher examines a pupil's science test and reports that the pupil's responses do not match the keyed responses for items 2, 7, and

9, he can be making a statement of fact. But fact can also be a statement based upon calculations where the data are derived from direct observation. If one says that John's I.Q. test score is 100 or that his reading score places him at the average of his class, he is making factual statements of this kind provided they are true. Furthermore, knowledge about particulars need not be concerned solely with specifics. If one says that the mean of the test scores of a particular group of pupils is 86 or that the total enrollment of the elementary schools of a specified city is 5.628, the statements are just as factual as if they were about specific persons.

The second kind of knowledge is conceptual. It is definitional. Concepts are designated by labels such as "learning", "withdrawal", "preseveration", "social class", "equality", "social distance", "reinforcer", and the like. When such terms are used so that the criteria are clear for deciding whether or not a given something belongs in the group which a word designates, one can speak of a definition. Conceptual statements are not true in the same sense in which factual statements are true. Statements of concepts are true by definition; factual statements by observation. The statement that John's responses on his science test do not match the key for items so and so can be tested by looking at the key and his responses. It is either true or false. But the statement that intelligence is what an intelligence test measures cannot be confirmed by observation. It is neither true or false, but rather a rule for a particular use of the word "intelligence". Intelligence can be defined in a number of ways. The usage can be fruitful or unfruitful, wise or unwise. But if the definitions are not equivalent, the term is used to label quite different concepts. Unfortunately this is often the case in educational discussions. One person uses a term one way and another person uses it quite differently. They are not talking about the same thing despite the fact that they are using the same word.

The usefulness of conceptual knowledge is contingent in part upon the clarity with which it is stated and in part upon what it permits one to do. Consider the following definitions: (a) learning is a change in cognitive structure; (b) learning is a relatively permanent change in behavior; (c) learning is the establishment of synaptic connections; (d) learning is a relatively permanent change in the nervous system resulting from environmental conditions; (e) learning is a relatively permanent change in behavior resulting from reinforcement. To ask which of these definitions is true is futile. It is to the point to ask which definition is likely to be most useful to the teacher or to the research worker. Some authorities hold that one cannot work with cognitive structures nor with the nervous system and that changes in these can only be inferred from behavior. They would therefore choose the definitions that emphasize behavior such as (d) or (e) on the grounds that such definitions yield ways to identify and produce learning.

How terms are defined therefore is not purely arbitrary. If gold is defined as a substance which has a melting point of 1.063^{0} and does not combine with oxygen under any condition, instead of as a substance that glitters, it is because more productive activities can be carried on with objects classified by these properties than by glitterness. It is evident that one of the most urgent and persistent problems of an emerging field of study is to classify its phenomena into productive categories. To do this is to become familiar with its subject matter through analysis, manipulation, and observation. The lack of this familiarity is perhaps the most serious barrier to the further development of research on teaching.

A third form of knowledge is correlational. It consists of statements of relationships between variables. For example, the correlation of high school grades with college grades has been established. On the basis of this correlation the success of students in college can be predicted within a margin of error. The question of whether or not the relationship, in any given case, is causal cannot be answered by the mathematical procedures by which the relationship is calculated. To answer that question one must consider other factors as well as the conditions and procedures by which the data were obtained. This form of knowledge is extensive in educational literature. It is too involved to consider at length in this paper. But it should be pointed out that one of the most persistent deficiencies in this form of educational knowledge is its failure to hold beyond the sample used in the study.

A fourth type of knowledge is related to the preceding and is called means-end knowledge. It consists of statements of ways by which ends-in-view can be attained. In some cases the means may be causal; in others, they may simply be instrumentalities. If a teacher acts to elicit a desired behavior and reinforces it, learning will result. The teacher's behavior is a means; the learning is the end. But it does not seem strange to say that the teacher's behavior caused the learning. Consider the case of an instrumentality. The teacher uses a test to get evidence of learning. The test is a means; the evidence is the end. It would be odd to speak of the test as a cause of the evidence.

Use of Research Knowledge

The primary concern in this paper is with the application of conceptual knowledge to the practices of schooling. Before turning to the uses of conceptual knowledge and how Protocols facilitate the application of conceptual knowledge to the practices of schooling. Before turning to the uses of conceptual knowledge and how Protocols facilitate the application of concepts it will be worthwhile to look briefly at some uses of the other kinds of knowledge. The practitioner no less than the researcher uses factual knowledge constantly. He does so when he prepares tests, scores tests, computes class averages, and assigns grades; when he makes records of pupil behavior or offers evidence to parents about their children's work; or when he participates in staff deliberations about problem cases where factual information from the school psychologist, social worker, or nurse is presented. As a matter of fact, the practitioner works in a context of factual information and techniques for determining and organizing such information, all of which educational research has made available during the current century.

Correlational and means-end knowledge permeates the work of the practitioner. Any time a teacher or principal considers the probable consequences of his actions in terms of psychological principles, he uses this sort of information. More often, however, the practitioner is unaware of its uses since such knowledge is incorporated in materials of instruction and learning. While much of these forms of knowledge comes, as in other professions, from the wisdom of the practitioners, a great deal of it is grounded in research. Just as the physician is typically unaware of the research that developed the drugs and instruments he employs, so too is the educational practitioner unaware of the research basis of the materials he uses to teach reading, arithmetic, spelling and other subjects. But neither is weakened in his performance if he can properly employ procedures and skills that are appropriate. To mention only a few developments stemming from research: useless information has been eliminated from test books in the interest of functional knowledge and skills; the density of the vocabulary in learning materials has been studied and controlled; materials have been more systematically graded to conform to knowledge about child development; repetition has been planned in keeping with knowledge about the acquisition skills. Any comparison of learning materials now available to teachers with those used in the schools seventy-five years ago would yield enough evidence to quell the nihilistic critics of educational research.

Although these uses of research results have led to marked improvements in the practices of schooling, there is still a firm belief among practitioners that research is of little use. Why does this belief persist? The most likely answer is that research has been of little value at points where decisions about teaching have to be made. For example, teachers understand that differences among pupils call for individualized instruction for certain purposes. But research workers have seldom come to grips with how to diagnose and treat individual conduct problems and learning difficulties, each of which is a crucial problem the teacher faces as he attempts to help the learner. Instead individualized instruction is taken to mean the adjustment of materials to the interests and abilities of the pupil with little concern for the difficulties he encounters as he tries to learn. Indeed, research has provided little knowledge with which to decide what type of barrier to learning the pupil has, to say nothing of how to remove it or help him overcome it.

Protocols and Problems of Learning and Teaching

Teaching is a many-sided operation involving a multitude of factors, skills, and materials. Perhaps the most important of these have to do with the problem deciding the affective and cognitive state of the pupil. Unless this decision is correct the teacher's subsequent behavior is likely to be misdirected. One of the functions of conceptual knowledge is to identify these states. Pedagogically speaking, concepts are catagories of behavior. To understand the individual's behavior is to understand the category to which it belongs. When a pupil's behavior is classified as perserveration, for example, one knows a number of things about it provided he knows the characteristics of the category. These are specified in the definition of the concept. The teacher's diagnostic activities entail a system of concepts by which learning barriers can be classified. If these concepts are adequate. his diagnosis will be correct provided he is skilled in observing behavior and has mastered the concepts.

It is important to recognize that teaching behavior is also classifiable. It can be grouped into such categories as the following: probing, reinforcing, withitness, explaining, structuring, focusing, contingency managing, and so on. These concepts can be expressed in terms of their behavioral indicators. Then by reference to Protocols a teacher can learn to identify these indicators and thereby understand the concept in concrete terms.

Concepts of teaching behavior can be used to diagnose teaching difficulties and also to exemplify means-end relationships. If a teacher uses a film or a tape recording to analyze his own behavior, he can decide upon the behavioral indicators which he needs to consider as he seeks to improve his performance. He is then using concepts diagnostically. But if he considers the effects of the behavior upon pupils, he will be thinking in terms of means-ends knowledge.

To identify a learning difficulty or a conduct problem is not the same thing as knowing what to do about it. Diagnosis is one thing; treatment is quite another. For example, if a pupil suffers from perseveration, he is likely to respond inadequately in situations calling for the use of prior learnings in unfamiliar ways. For example, he will persist in attacking a problem over and over again in the same way even though the approach is unsuccessful. He thus reduces his chances of solving it. A teacher who notes this behavior in a pupil may not know what to do about it. Or he may have been taught how to help a pupil overcome this difficulty, but be unable to tell when he has it. In either case the teacher will be uanble to apply the relevant research knowledge.

It is frequently assumed that the path from research knowledge and theory to practices is direct and unencumbered. For example, if one knows how learning occurs, he thereby knows how to teach. But one cannot go directly from knowledge to its practical application because there are problems that arise with respect to procedures and materials. To apply correlational or means-end knowledge it is just as necessary to understand the phenomenon to which it is to be applied as it is to understand the principles themselves.

It is important to note that the behavior indicating a learning difficulty or a conduct problem is not necessarily the cause of the pupil's failure. The behavior may simply be indicative of an underlying condition that precludes learning. In the case of perseveration the cause may be attributable to retroactive inhibition. The pupil thus continues to perform again and again the response that worked in the previous situation, thereby impending the emergence of a new and perhaps more successful response.

Fortunately, however, successful treatments do not always depend upon causal knowledge. Perseveration, for example, can be handled by encouraging the pupil to try new attacks and by reinforcing variations of response. What has just been said should not be taken to mean that causal knowledge is useless to the practitioner. It provides him with deeper understanding of the phenomena with which he deals. But it is even more important to the research worker and theorist, for it is necessary for the development of preventative pedagogy. If the causes of all learning difficulties were known and could be removed, learning would then proceed without crippling obstacles and at a pace consistent with the pupil's capacity to learn. This is an ideal that apparently lies beyond the reach of research. But elements of preventative pedagogy are already appearing without the label. Some conduct problems are induced by teacher behavior. For instance, if a teacher fumbles the transition form one activity to another, pupils become disruptive. Such disruption can be prevented by skillful negotiation of the transition. Also, where a particular learning is dependent upon a prior learning, the chances of the pupil's failure can be reduced by assuring that the prerequisite learning is acquired.

To return to remedial pedagogy, the main problem is to identify the pupil's affective or cognitive state and to make appropriate responses to it. As noted above the identification function is carried on with conceptual knowledge. The teacher needs a system of concepts coordinate with a typology of teaching-learning problems, if he is to carry on the job of identification successfully. The development of such a system is in its early stages. Considerable headway has been made in the fields of reading and spelling, somewhat less in arithmetic, and very little in the sciences, social studies, English, arts, and other disciplines.

Yet there are many useful concepts. The trouble is that teachers do not know how to utilize them. Why is this so? It is not because they are unacquainted with the concepts. They have studied them in course after course. They can define the concepts and discuss them in various relationships. But the definitions are vague and ambiguous, the discussion is loose and rambling, and their knowledge is merely verbal. Little wonder that this is so, for the behavioral indicators are seldom specified in the definitions and no practice in identifying them is provided. However, the trouble is more deep-seated than that. The university instructors who teach the concepts have difficulty in specifying the behavioral indicators and are often content with vague definitions and verbal examples. If the teacher is to learn to identify kinds of behavior and to understand what they indicate about the affective and cognitive state of the pupil -- his problems and difficulties-- instruction of teachers must be exacting and rich with experiences in identifying the indicators of concepts in school settings.

Pitfalls in the Use of Protocols

It has already been noted that the unique function of Protocols is to exemplify the behavioral indicators of concepts. In verbal form concepts typically do not become functional in the teacher's behavior because the teacher cannot identify the behavior covered by the concept. When the behavioral indicators are displayed on film or tape, teachers readily see what the concept means in the behavioral world. They are then more likely to use the concept in teaching.

In the use of Protocols certain pitfalls should be noted. The first is the belief that Protocols are too simple. It is important to recognize, however, that empirically oriented concepts are always relatively simple when these behavioral indicators are depicted. Concepts in science generally become simple when they are presented in operational or behavioral form. For example, when the behavior of a pupil is reinforced, the indicators can be observed as consisting of approval by either peers or the teacher. But approval takes many forms. It can be verbal, a nod, a smile, and so on. It can be general as when the teacher says, "Mary, that is good," it can be specific as when the teacher says, "Mary, the distinction you made between imperialism and colonialism is important." Mary is likely to react differently to these two instances of reinforcement, the first is likely to be less powerful. These distinctions can be observed in a Protocol together with the pupil's reaction to them. Some individuals who view Protocols, being unfamiliar with the problems of teacher training, are likely to say, "That is too simple to be of help to teachers." On the other hand, if he reads descriptions of the same situation (and there are many similar cases in the literature), he is likely to think the material is challenging and useful.

A second pitfall is the tendency of undisciplined observers to accept or reject teacher behavior before they understand it. The study of teaching and learning is fraught with prejudices. Some individuals are biased toward one type of behavior and against others, and so it goes for other individuals, and they judge what they see as either good or bad accordingly. While it is unlikely that biases can be eliminated from pedagogical considerations, it is possible forprofessionals to make objective observations, to see behavior as it is, and to classify it into descriptive categories. Only then does a professional attempt to decide its worth. One of the uses of Protocols is to help school personnel learn how to observe behavior objectively. Protocols are not designed to exemplify good and bad practices, but rather to present the behavioral attributes of concepts. The attributes will be embedded in a kind of pedagogical practice in one Protocol and in a different sort of practice in another. The object is to learn to identify the attributes or behavioral indicators and not to judge the desirability of the practice.

Another pitfall is the tendency to become involved in distractive aspects of a Protocol. A Protocol is never pure in the sense of depicting the behavioral indicators alone. Always there are other aspects of the total situation comprising the Protocols. Among these are tone of voice, dress of teachers and pupils, attendent forms of behavior, and so on. The observer brings many concepts to a Protocol. These can lead him to see many different things. In fact, one can attend to an indefinite number of things and never see the behavioral indicators at all. This is also true in other fields. For example, one who views a slide through a microscope will see many things and will not know whether he is attending to the appropriate object unless he has directions. It is necessary for an observer to have an idea of what he is looking for when he observes a Protocol. The printed materials provided with Protocols serve this purpose.

To sum up, it can be said that Protocols represent one way in which the results of research can be applied to the task of preparing teachers. If properly used they will develop the teacher's ability to observe behavior objectively, to see aspects of behavior to which he was previously not sensitive, to understand concepts in terms of behavior as well as verbally, and to recognize the importance of diagnosing behavior by a system of categories.

Chapter IX

Summary and Next Steps

By Donald E. Orlosky

The Protocol Materials Program provided initial experiences in several critical areas of development and provides a solid foundation on which future steps can be taken. A discussion of these areas and the accomplishments within them leads also to a discussion of unfinished tasks. The four areas in which accomplishments and discussions about next steps is provided include: (1) Protocol Material development, (2) personnel training, (3) research, and (4) dissemination.

Protocol Materials Development

Over 150 Protocol packages were produced in the pedagogical domain and basic fields of study during the five years of the program. These Protocols include episodes in the elementary and secondary schools and most of them were recorded in classroom settings. A complete list of the materials is provided in a catalog of Protocol Materials.[1] The catalog is organized into six areas: (1) educational psychology, (2) language, (3) literature, (4) reading, (5) social sciences, and (6) teaching competencies.

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The programs of pre-service and in-service education can draw on these Protocols to teach conceptual knowledge. Considering that the term "Protocols" was virtually unknown five years ago and that no Protocols for teacher training were in existence at that time (at least in the form developed in this program) the production of these materials is no mean accomplishment. The problems that were faced and solved, the program coordination that was planned and implemented, and the quality of the products all serve to justify the earlier decision to launch the Protocol program.

The successful beginning shows that the production of Protocol Materials is a feasible undertaking. Now that this initial hurdle has been overcome, the next moves can be taken with more confidence. These next steps, which include additional production, should be taken because the number of Protocols is not sufficient to provide a complete collection of materials for a comprehensive program of teacher training. Furthermore, the Protocols have proven effective in helping teachers acquire concepts and improve their diagnostic and interpretive ability in the classroom. Many gaps remain when the amount of production is compared to the need. Concepts which have been developed in elementary school settings should be redone in the secondary schools with appropriate alterations. No Protocols were developed in many basic fields of study such as mathematics and science because sufficient funds to produce these additional materials were not available. Most of the Protocols illustrate instructional episodes but teachers also encounter situations outside the classroom with peers, administrators, parents, community representatives, and with pupils in other settings that should also be developed into Protocols. There are episodes unique to particular settings such as urban or rural or other variations whose portrayal would improve the teacher's ability to recognize more factors and complex events and diagnose them properly. One can refer to the master coordinate system provided in Chapter 1 to realize that the total production of 150 products represents an important but limited amount of production.

The master coordinate system gives a general structure that helps determine the areas in which future production might occur. A catalog was also prepared that listed concepts in the pedagogical domain.[2] The concepts that have not been developed into Protocols but are listed in this publication are a good source for selecting concepts for additonal development. The catalog of pedagogical concepts was limited to concepts in interactive teaching but listed collegial relationships, teachers and administrators, and the teaching profession and the broader community as additional important areas. Another catalog listing teaching skills was produced.[3] The skills included such areas as early educational programs, social studies teaching skills, and competencies for science teachers. The skills listed in this catalog can also serve as a basis for deriving concepts that should be considered for additional Protocols. Documents were developed in the fields fo social studies[4], English[5], and mathematics[6] in which concepts were identified that would be appropriate for future production.

All of these documents define areas to be included in future development and the concepts that should be considered. Those who have been developing Protocols represent a body of experts who could be utilized to direct future development. The merger of people and ideas to solve the problems teachers encounter when they try to understand and diagnose the events they face is the ultimate purpose of Protocol development. The experience in the Protocol Program suggests that these materials can contribute substantially to training teachers in how to conceptualize behavior.

Protocol Materials development now stands on a threshold where success in early development provides the basis on which future development can proceed with confidence if the resources can be assembled to continue production. The source of additional funds might vary from private to public agencies but the time has never been better in terms of the educational perspective to increase production to the level that will provide the teacher training agencies with a comprehensive resource of Protocol Materials.

Personnel Training

The training of educational personnel in the Protocol Program includes at least three groups of people. One group includes those trained to produce materials. Another group includes those who use materials in their teacher training program and must receive training in the proper deployment of Protocol Materials. The third group includes those who make budgetary or programatic decisions and need training to make wise choices about spending their resources on the acquisition of products. A discussion of each level of training illustrates procedures that have been used and the activities to be considered for the future.

Producers. The first Producers of Protocols were the Project Directors responsible for the development of products stipulated in proposals submitted to the United States Office of Education. The Directors had a general notion of the task they faced, but the details were worked out through the hard knocks of experience. Chapter 3 by Lanier and the discussion in Chapter 5 by Lid, describe the experience and knowledge the Project Directors acquired in the process of producing Protocol Materials. Training in conceptualizing and the technical knowledge needed for actual production are the two major components in training Producers. Other essential skills include the ability to communicate clearly in writing and to conduct effective field tests. These four areas of training proved to be critical.

Project Directors and the staffs they assembled became production teams that learned how to produce these materials. It is estimated that over one hundred people have had direct experience in Protocol Production and constitute a resource of people who now could produce additional materials and also train others. Nine people were selected to receive training and to relate their training to the development of materials in English, social studies, and mathematics. Although these nine people have generally not had the actual experience of directing the production of Protocols, they represent a second echelon of producers who could serve as Project Directors.

Future needs for training additional personnel in basic fields of study that are not presently represented, but the number of qualified producers exceeds the current availability of funds to actually produce materials.

Users. Users of Protocol Materials need information about the topics covered in Protocol Materials, assistance in selecting appropriate Protocols for their purposes, and training in how to use Protocols.

Publicity about Protocols has been circulated through numerous outlets and continued activity is needed for Protocols to become a common part of the knowledge and language of the profession. The publicity about Protocols has been the main vehicle to carry information about Protocol Materials to potential users. Information has been disseminated through brochures, catalogs, published articles and advertisements in educational journals. Presentations have been made at annual national and regional meetings of major organizations and special workshops conducted by the LTI, or Project Directors. The proper use of materials is described in the written materials that accompany Protocols and technical assistance has been supplied to interested users about the proper utilization of Protocols.

Protocols continue to be used in a variety of ways despite the specialized purpose for which they were originally produced. It is understandable that users might regard any recording of behavior to be useful to illustrate "good" or "bad" teaching or to provide a "model" for improving teacher skills. Some users employ Protocols for these purposes. Other users continue to bypass the intended behaviors in the film and react to irrelevancies such as class size or school facilities. Some people also regard any depiction of behavior or even any teacher education materials to be useful "Protocol" and stretch the term beyond its intended use. Continual training to promote the proper use of Protocols is needed. The other uses found for Protocols might be effective under special circumstances, but if users expect something different from Protocols than was intended then the benefits from Protocols will be seriously diminished.

Continued training of personnel at conferences and special workshops on Protocols should help solve some of the current misconceptions about their use. When Protocols are more frequently included in textbooks, course outlines, research activities and training projects, then their proper use should also occur with more frequency. Efforts to promote these training activities should continue by those who have been most directly involved in the development of Protocols. These agencies include the United States Office of Education, the Leadership Training Institute for Educational Personnel Development, Project Directors, and those who have used materials according to their intended use with desirable results.

Decision makers. Those who control the expenditure of funds or plan pre- and in-service programs of preparation are often the most instrumental personnel in any dissemination effort. The LTI Directors decided to inform teachers in the State Departmentsof Education and the large school districts so they could make informed decisions about the acquisition and the use of Protocols. The intent was to assure that teachers, each state department and each large city school system would have at least one well-informed person to assist with plans to use Protocols. It was also considered important that classroom teachers review Protocols and render a judgment about their feasibility.

A three-day workshop was held in August, 1974, for representatives from the fifty states. Each state was asked to identify the individual in the state department of education who was responsible for in-service teacher training and staff development. The purpose of the workshop was to increase the level of understanding about Protocol Materials. The workshop was attended by eighty people representing forty-four states. Some of the state and local training programs that were developed during the 1974-75 year can be traced directly to this workshop. Also, some state departments ordered some or all of the Protocols for their own resource centers. The workshop seemed to accomplish its purpose of stimulating interest and promoting dissemination of Protocols at the state department level.

A presentation was arranged through the Association for Supervision and Curriculum Development to meet with staff development personnel from the large cities. This meeting was held in December, 1974. The purpose of this presentation was to distribute Protocol brochures and other information to enable these cities to consider Protocols in their staff development plan. The impact on these cities has been minimal as far as can be determined. Two large cities have been engaged in programs directly related to Protocol Materials. Large cities may be too preoccupied with other matters to become active in materials acquisition and staff development activity. Whatever the reason, the impact of Protocol Materials on staff development activities in large cities still should be fostered because large cities employ a large number of teachers who participate in staff development activities.

Classroom teachers constitute another critical group who make decisions on the use of materials for in-service training. Often times, the needs of teachers and the programs provided for teachers are teacher based. This is logical and proper and is becoming more frequent. Thus a series of workshops were planned for teachers to view and evaluate Protocols. Only one workshop has been held to date. Plans to continue more workshops have been made but additional funds are needed to complete this series.

The number of people who have received "awareness training" about Protocols is too few at the present time. An extension of past activity is needed and the new products that have been developed need to be added to the knowledge of those who previously attended workshops. Part of this task will be fulfilled by the continued publicity about Protocols through the LTI. A systematic and comprehensive program should be expanded that will continue to include more potential users than have received training at the present time.

Research

The opportunity to conduct research in at least three broad areas has been made possible through the Protocol program. In each area the research represents a beginning that should be continued through extensions and additions to these early studies. The three areas include (1) determination of which concepts should be developed as Protocols, (2) the assessment of the materials in terms of user attitudes and perceptions and (3) the effectiveness of the materials in changing behavior or improving interpretive abilities. The third area of changing behavior may apply to pupils as well as to teachers and includes covert and overt behavior. Covert behavior may be inferred from measures of concept acquisition or in some cases from behavioral changes that appear to be the consequence of increased conceptual knowledge.

The concepts chosen for Protocol development should have at least two characteristics. One characteristic is that the concept should have a proven or-probably positive relationship between its acquisition and the effectiveness of the teacher. The concepts selected should also require the extra instructional and development effort of Protocols for learners to acquire them. Both of these considerations are important if Protocol development is to be worthwhile and financially defensible. Both questions are researchable. Considerable work that has gone into the existing Protocols was devoted to answering these two questions. Concepts used in future productions should also be selective on these bases but additional research must be conducted on these two elements to enlarge the supply of Protocols properly.

All teacher education materials should undergo field testing to make certain they accomplish their purposes and are also acceptable to users. Most educational products are judged subjectively by their producers on this basis but few products are thoroughly field tested. A publication on evaluation and assessment has been developed on the basis of experiences in the Protocol Program to help Project Directors conduct field tests of educational products.[7] Each Protocol is a product that lends itself to researchable problems. One of the strengths of the Protocol program has been the "field testing and revising" phase of development. It is essential that this step be continued in future development.

The third category of research that comes within this program is analysis of any changes in teacher and pupil behavior. The instruments to measure these changes and the research design that discriminates between Protocols and other variables must often be devised specifically for the specific product. The research tasks and opportunities to learn more about teaching, teacher effectiveness, pupil learning and instructional issues are inherent in this phase of Protocol Material assessments.

The research that is appropriate for Protocol Materials is applied research that has practical application. It can seek evidence about the curriculum for teacher training, effectiveness of materials for training teachers, and the impact of the instruction of teachers and pupils. Protocols become part of the essential ingredients needed for the researcher to carry out his work.

Dissemination

The dissemination of Protocol products requires an adequate stock pile of materials, publicity about the materials, and the means to receive orders, fill orders, maintain records, inspect, and repair materials. The rental and sale prices should be established to generate enough income to maintain the dissemination operation without pricing products out of the marketplace. These factors are fundamental necessities in the dissemination of educational materials.

Dissemination of products has been arranged through two different approaches. Under one approach the Project Director makes his own arrangements to disseminate Protocols. Each Project Director had the option to negotiate and select the dissemination means they wanted and to arrange the conditions of dissemination individually. The LTI established another approach by creating a National Resource and Dissemination Center (NRDC) with a board of directors elected by the LTI membership and Project Directors. The NRDC determined the conditions for dissemination and made its resources available for the Project Directors to use for dissemination. In both cases, the LTI has promoted the principle of making the Protocols available at the least possible cost and with the most convenient arrangement for users. The LTI has also promoted information about all Protocols whether they have been distributed by the NRDC or another agency.

The logistical tasks of dissemination requires the employment of secretaries, shipping clerks, acquisition of storage space, inspection and repair facilities and equipment, accounting procedures, etc. These details represent a major effort and it is no small task to set up and maintain a distribution operation. Prior to establishing a dissemination agency some major problems must also be solved such as copyright arrangements, royalty distribution, contracts between universities and the distribution agency, and placement and clearance of internegatives to obtain multiple copies. Detailed explanations of problems and their solutions are not the intent of this section although it is important to underscore that the establishment of a dissemination procedure requires the solution to these problems. The purpose of this section is to report that logistical problems were solved by the NRDC or by the individual agencies chosen for distribution of Protocols. During the first year of operation, the NRDC was the distributor for thirty-eight percent of the 139 Protocols and during the second year the percent increased to fifty-six percent of the 151 Protocols. Three additional Project Directors elected the NRDC to serve as the distribution agency after the first six months of this operation.

The dissemination of products is dependent on advertising, quality of the product, and the availability of funds for users to purchase or rent Protocols. Only advertising is under direct control of the distributor. The quality of products is dependent primarily upon the work of the individual Project Directors. The funds to acquire Protocols are beyond the control of the NRDC or the Project Directors. However, advertising and publicity is clearly within the control of distributors and has been one of the major activities undertaken in the program.

A concentrated effort to advertise products began in December, 1974, and less than one year has elapsed since this activity began. During the first year 140,000 brochures about Protocols were distributed through direct mail, distribution at conferences, and in response to requests. Articles have appeared in periodicals and newsletters, and presentations have been made at professional meetings, special workshops, and at meetings of Project Directors of other federal programs engaged in training educational personnel.

Beginning in the fall of 1975 a new brochure listing additional materials was prepared. It was decided to print fewer brochures and rely more heavily on advertisement in periodicals to publicize Protocols. This decision was based on the judgement that the advertisements will reach additional audiences and supplement the brochures. This multiple approach should generate as much or more activity at less cost.

The NRDC has been filling orders for sales and rentals at an annual rate that projects to about 1800 units. This distribution is sufficient to maintain the NRDC and also is evidence that the dissemination operation is successful. Most of the dissemination has been to the pre-service area which suggests that the in-service programs need further promotion to realize their full potential in the utilization of these materials.

Summary

It is recommended that additional production should be continued. The number of Protocols available needs to by supplemented by additional materials to give more comprehensive coverage to the nation's teacher education program. Personnel training for production of materials should be continued concurrently with any new production but the highest priority for personnel training should be for users of Protocols and those who make decisions about acquiring Protocols. Research activity is inherent in Protocol production and has high potential in the use of Protocols. Inducements and encouragement to conduct research in the use and effectiveness of Protocols should be provided by the universities and schools engaged in research activity.